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THE BIRDS OF THE CARIBOO PARKLANDS, BRITISH COLUMBIA[1]

BY J. A. MUNRO[2]

Abstract

The interior plateau of British Columbia between the 51st and 53rd parallels of latitude and the 120th and 126th degrees of west longitude constitute a definite biotic area designated as the Cariboo Parklands. Composite forests of lodgepole pine and aspen, grasslands, and shallow valleys containing numerous lakes, ponds, and marshes of various types are the principal physiographical features. Ten vertebrate habitats, each with a characteristic biota, are recognized. The region is an important migration route for waterfowl and constitutes the principal, and for some species the most northerly, nesting ground in the province. Nesting grounds are in units that vary greatly in size, in type of cover, and in their food potentials. They are subject to contraction in space, and consequent reduction in productivity, because of periodic seasons of drought. The biota is in rapid process of modification as a result of various human activities. Agricultural developments permanently impaired waterfowl habitat in some places but in other places, where the outlets of ponds have been dammed in order to store water for irrigation purposes, nesting grounds have been improved. The summer land bird population is derived mainly from the south and it includes several species that here reach the northern periphery of their range. The population also contains species of eastern origin that are not known to nest further south in the province. A total of 212 species and subspecies of birds are recorded for the region. Observations of the life history and behaviour of certain species are presented in detail.

Introduction

British Columbia, in the process of an economic expansion that involved increasing exploitation of natural resources, has undergone profound modification of a physical and social character during the past 50 years. The tempo of change, slow at first, gradually accelerated through the years and has currently attained a speed in accord with that which impels the enormous vigour of the war effort. In the years that follow the achievement of peace, in order to accommodate the needs of a growing population and Canada's importance in a world economy, provincial resources will be exploited at an even greater rate.

The future of wildlife, a self-renewing resource derived from the land and entirely dependent upon it, is directly involved with human expansion in space. This being so, and because wildlife is a source of wealth in the fullest sense of the term, it is a matter of some importance to take stock from time to time, to record the results of such stock-taking, and to put on record also

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Contribution from the National Parks Bureau, Department of Mines and Resources, Ottawa, Canada.

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what can be learned of past conditions before the memories of these have passed with those who held them.

It can be said with confidence that local studies of wildlife and wildlife habitat, as they exist to-day in a time of rapid change, will prove to be of the utmost value in the years ahead. The future historian, whether he deals with social forces or with land use and land management or both, will welcome such sources of information, as we to-day would welcome—if such existed—a detailed account of an earlier and more primitive environment. In this firm conviction the present study has been prepared.

It is an attempt to review the bird fauna, hitherto not fully reported, in a limited area of British Columbia that is in process of rapid modification. It deals also, to a limited extent, with the more obvious of these modifications as observed during the years 1931 to 1944, inclusive.

During the period of this study many sections of the area were visited at different times from April to October. The objects of these visits being the study of waterfowl distribution, life history, and food resources, it was unavoidable that detailed observations of other bird groups should be curtailed, therefore it is not suggested that the bird list here submitted is complete. Future field work undoubtedly will add substantially to it.

Two early papers refer in part to the bird life of the Cariboo Parklands. The earliest (23), by Samuel N. Rhoads, who spent the period June 18 to July 7, 1892, at Clinton and Lac La Hache, notes 73 species from these two localities and from the region between them, 29 records being supported by specimen representation. Several of the sight records included, e.g., California brown pelican and black-throated gray warbler, were undoubtedly incorrectly identified; others may properly be questioned. A later paper, by A. Brooks (1), is a briefly annotated list of 94 species and subspecies observed during 1900 and 1901 in two quite different biotic areas, namely, the heavily forested region adjacent to Quesnel and the Cariboo Parklands to the south. Many of the records are without precise information as to locality and the majority lack dates of observation. In connection with 23 species, definite localities, within the northeastern section of the territory covered by the present paper, are cited.

In 1932 and 1933 Mr. Eric M. Tait was employed by the National Parks Bureau to band ducks at Buffalo Lake. During the periods spent there, viz.; Aug. 12 to Oct. 9, 1932, and Aug. 30 to Oct. 19, 1933, he made daily observations of bird life and obtained important records that with his permission are included in this paper. All references in the annotated list to species observed or collected at Buffalo Lake are transcribed from Mr. Tait's notebooks. I have examined the specimens mentioned.

Mr. Leo Jobin, Williams Lake, who has studied and photographed the local wildlife for a number of years, kindly permitted the use of numerous records, the majority supported by photographs and exact dates of observation. Mr. P. W. Ogden, Mr. F. G. Forbes, and his son, Mr. G. H. Forbes, Lac La Hache,

supplied valuable migration data and information concerning winter birds; Mr. A. E. Porsild, Curator of the National Herbarium, and Mr. George A. Hardy, Botanist, British Columbia Provincial Museum, identified many of the plants referred to in the following pages, and Mr. Hugh B. Leech, Dominion Department of Agriculture, identified the aquatic Coleoptera taken from birds' stomachs. I take much pleasure in acknowledging the co-operation extended by the persons mentioned.

History and Physiography

During the latter part of the last century much of the land adjacent to the Cariboo Road that seemed suited to cattle raising was occupied for this purpose. The chief market for the produce of the pioneer was the placer mines of the region to the north. Thus the social economy of the Cariboo Parklands was based on the cattle business; it continues to be so, with a greatly expanded market outside of the territory.

Ranching areas were selected with two requirements in mind, namely, that of summer grazing and that of natural hay meadows, which would provide a supply of winter forage. Later came the planting of cultivated forage plants and, because this is a country of relatively light precipitation, it was necessary to take advantage of all available water that could be stored for irrigation purposes. Thus many existing ponds, sloughs, and streams were dammed to retain surplus water in spring.

As time went on modifications of environment followed a pattern that has become a familiar result of settlement in a dry climate. The water table gradually lowered from a number of causes, not the least of which was the reduction in beaver population by trapping. Overgrazing, as the size of cattle herds increased, was another factor and the process of deterioration was accelerated by the periodic cyclic swing to dryer years. The history of early dry periods is not known but during the years 1931 to 1934, inclusive, a very large number of shallow lakes and sloughs dried out completely or held water for only a few weeks in early summer. In the following years increased precipitation corrected the adverse situation to some extent but an earlier condition in which most of the natural depressions held water all summer and created optimum opportunities for wildlife has never been fully regained.

The dry belt forests seem influenced only slightly by recurring periods of drought and, as they contain little merchantable timber, have sustained no perceptible modifications except such as are brought about by fire. The grasslands up to the present, while partly denuded, have not become infested with the introduced spear grass, *Bromus tectorum*, now universal in the dry belt regions to the south, and the natural attendant flora persists.

Just what effects the continuing modifications of environment will eventually produce on the social future of the community and on the original biota of the region can only be conjectured but some reflections on this subject are pertinent to the discussion.

A biota is not an accidental conglomeration of plants and animals but rather a family of interrelated and mutually dependent units. The introduction of foreign elements of plant and animal, i.e., agriculture and husbandry, into this unity is disruptive. If pursued indefinitely without adequate control it may become fatal to the continued existence of the land as a productive element.

Man, in company with all other animals, occupies, and derives his existence, from the land. To-day we cannot measure the intricacies of this mutual

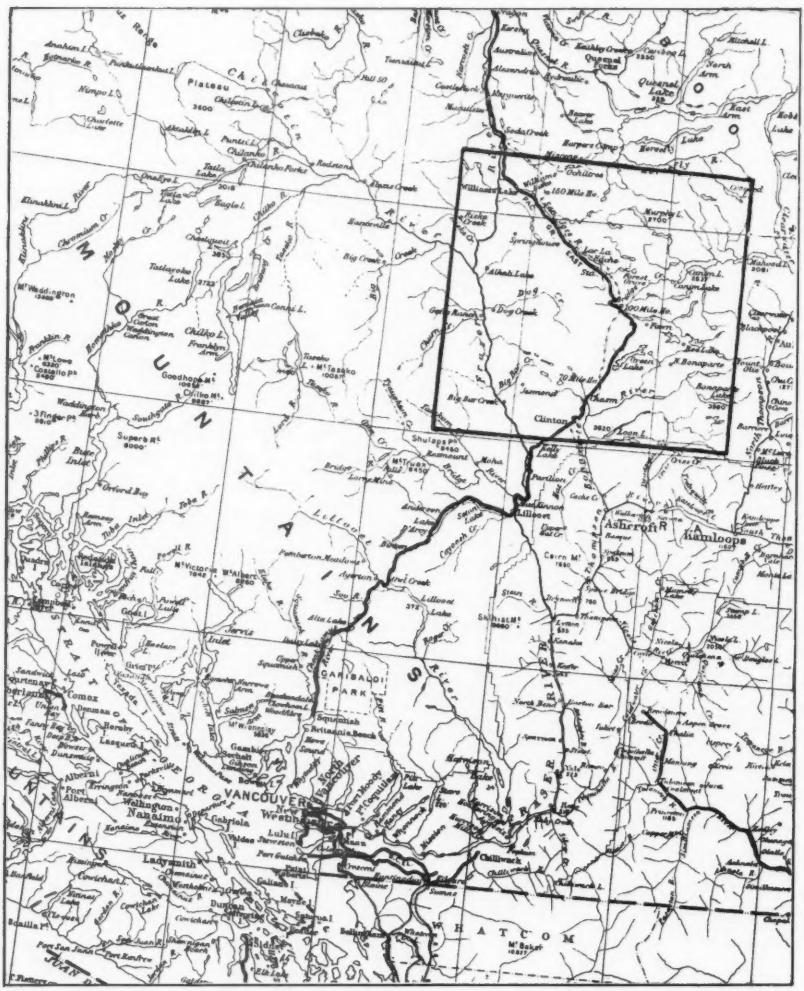

FIG. 1. *Map of part of southern British Columbia, portion outlined showing approximate boundaries of Cariboo Parklands.*

occupation nor determine Nature's limit of toleration to man's expansion. That there is a limit cannot be denied. We know, for example, that because of land misused vast areas of the old world once supporting vigorous civilizations are now desert.

The area under review in this paper is a characteristic sample of the park–forest and grasslands complex that is conspicuous in that part of the interior plateau between the 51st and 53rd parallels of latitude and the 120th and 126th degrees of west longitude. The precise position of the area studied is outlined on the map (Fig. 1). It is accessible in part by the Cariboo Highway and numerous secondary roads and trails.

The altitude in the parklands varies from 2000 ft. to 3600 ft. approximately. The climate is characterized by short summers with high daylight temperatures and cool nights, and moderately cold winters in which periods of subzero temperatures are usual. No exact temperature figures for any locality are available.

The territory might be described as one of shallow east and west valleys from which grasslands and aspen-covered slopes ascend to forested ridges. One of the notable features is the multitude of water areas of varied extent, ranging from small, shallow ponds and sloughs to deep, usually narrow lakes up to 12 miles and more in length. All the latter are tributary to either the Fraser or the North Thompson Rivers. Ponds and sloughs are situated in open meadows or in forest openings (Fig. 5). Some of the larger lakes are forested to the shores; in others the littoral is part forest, part open grassland. There are relatively few streams and, excepting those that connect large lakes with the main river system, these have been impermanent during the past 15 years and held water only in spring and early summer. The main constituents of the forests are lodgepole pine (*Pinus contorta*) and aspen (*Populus tremuloides*) with Douglas fir (*Pseudotsuga taxifolia*) usually most abundant on the higher ridges. Engelmann spruce (*Picea Engelmanni*) and black cottonwood (*Populus trichocarpa*) occur along the shores of the larger lakes and the former dominates the shore edge of some woodland ponds and marshy places. None of the forest is continuous for any great distance. Everywhere it is broken by stretches of grassland or by low-lying areas in which willows of various species, dwarf birch (*Betula glandulosa*), and other deciduous growth are dominant.

Life Zone Classification

Considered on the basis of the Merriam life zone formula the region under discussion might be classified as intermediate between the Transitional and Canadian zones. Actually it is a latitudinal belt of territory with definite floral characteristics, perhaps the most important being the park-like lodgepole pine and aspen forests. It derives some of its biota from the north and east, some from the south, and on the other hand is conspicuously lacking in elements common to both. In short it may be termed a definite biotic region for which the name Cariboo Parklands is proposed.

Into this biotic region are intrusions, along the Fraser and Bonaparte Rivers, of a quite dissimilar association of plants and animals, namely, the dry southern forest of which yellow pine, *Pinus ponderosa*, is an indicator. On the east this conifer apparently reaches its northern limit near Clinton; how far it extends northward on the west, up the valley of the Fraser River, has not been determined. Undoubtedly within the area of penetration these intrusions modify the otherwise homogeneous character of the picture.

The identification of localities by mileage, e.g., 70 Mile, has been the custom of the country since stage coach days and indicates the mileage on the Cariboo Road north from Lillooet.

When the sum of environment is broken down into smaller units, quite distinctive features that separate this biotic region from those surrounding it can be recognized. The more conspicuous of these are discussed in the following section.

Vertebrate Habitats

Lodgepole Pine and Aspen Forest

This is the largest habitat unit and covers many square miles of both level and sloping territory. In places it is a more or less even mixture of pine and aspen but there are clear stands of the former and in depressions, or when encroaching upon grasslands, aspen may predominate (Fig. 7). Here and there are solitary Douglas fir, some very old and low-branched, and this species dominates some of the ridges. There is little underbrush, the trees are wide-spaced (park-like), the ground hidden by forest grasses amongst which grow many flowering plants. Some of the more conspicuous species are: Indian paint-brush, *Castilleja miniata;* Burke lupin, *Lupinus Burkei;* shining arnica, *Arnica fulgens;* windflower, *Anemone multifida;* and sticky geranium, *Geranium viscossimum.* Parts of the forest floor are covered with masses of twinflower, *Linnaea borealis.* Other characteristic species are: bunchberry, *Cornus canadensis;* wintergreen, *Pyrola secunda;* coral root, *Corallorhiza trifida;* and an orchid, *Calypso bulbosa.* A more detailed list of plants collected in this and other habitats will be found in a report of the British Columbia Provincial Museum (3).

Mammals of this habitat are: dusky shrew, *Sorex obscurus;* cinereus shrew, *Sorex cinereus;* black bear, *Euarctos americanus;* coyote, *Canis latrans;* chipmunk, *Eutamias amoenus ludibundus;* red squirrel, *Tamiasciurus hudsonicus columbiensis;* flying squirrel, *Glaucomys sabrinus columbiensis;* white-footed mouse, *Peromyscus maniculatus artemesiae;* red-backed vole, *Clethrionomys gapperi;* and varying hare, *Lepus americanus pallidus.*

Characteristic birds are: red-tailed hawk, pileated woodpecker, yellow-bellied sapsucker, hairy woodpecker, Hammond flycatcher, Canada jay, mountain chickadee, red-breasted nuthatch, American robin, hermit thrush, golden-crowned kinglet, ruby-crowned kinglet, Audubon warbler, and Oregon junco.

The Dry Grasslands

The total of this habitat is extensive and second in size only to that of the lodgepole pine and aspen. Some of it is flat, some slopes upward from meadowland or marshy tracts along streams, sloughs, and lake margins. There is much that is rolling or hilly and much is interspersed with stands of aspen and shrubbery, the principal species being soopolallie, *Shepherdia canadensis;* black gooseberry, *Ribes irriguum;* black currant, *Ribes Hudsonianum;* white spirea, *Spiraea lucida;* Say rose, *Rosa Sayi;* twinberry, *Lonicera involucrata,* and waxberry, *Symphoricarpus racemosa.* One or more of these grow thickly in depressions, in wooded draws or gullies, and along the perimeter of the forest. The smaller flora is dominated by grasses and forbs of various species amongst which appear a succession of flowering plants commencing in late April with a crowfoot, *Ranunculus* sp., followed by *Androsace septentrionalis, Draba nemorosa, Gilia gracilis,* rock cress (*Arabis divaricarpa*), and mouse-ear chickweed (*Cerastium arvense*) (Fig. 4). Later come a variety of fleabanes, vetches, loco-weed (*Astragalus canadensis*), *Eriogonum* species, cinquefoils, gromwel (*Lithospermum augustifolium*), valerian (*Valeriana septentrionalis*), *Phacelia linearis,* everlasting (*Antennaria rosea*), and finally, in late summer, the vigorous yellow of gaillardia, hawkweeds, golden-rod and the mauve and blue of asters. Pasture wormwood, *Artemisia frigida,* is a characteristic plant; the tall, shrubby species of *Artemisia* are absent.

Some of the birds associated with the grasslands are dependent upon a different type of habitat for nesting sites, as the crow upon adjacent willows and aspens. The red-winged blackbird, yellow-headed blackbird, and Brewer blackbird, so conspicuous there in late summer, have been raised in quite different surroundings.

Of the nesting birds the dusky horned lark, western meadowlark, vesper sparrow, and savannah sparrow are exclusively of the grasslands. On the other hand the pintail that nests commonly there raises its young on lower levels adjacent to marsh or lake.

A jumping mouse, *Zapus hudsonius tenellus,* is more abundant here than elsewhere and it is forage territory for numerous other mammals associated with other habitats.

The Highway

Birds and mammals on migration, and at other times also, follow a road's course just as they follow the course of a river—there are few places more productive of profitable observation. The section of the Cariboo Highway between 100 Mile and Williams Lake cuts through a cross-section of the grasslands and the lodgepole pine and aspen habitats (Fig. 3). It passes alongside two large lakes (Lac La Hache and Williams Lake) and many small ones of various types.

Cliff swallows in great numbers inhabit many of the old log buildings that are so picturesque a reminder of an earlier day. After a shower the swallows come to the road and flutter down to the rain pools like so many butterflies

as they gather material for their mud nests. Western meadowlarks sing from the fence posts and compete with sparrow hawks for their possession. The latter become abundant in early autumn when a migration from more northern latitudes takes place. From the road also are seen migrating red-tailed hawks, American rough-legs, marsh hawks, occasionally peregrine falcons, and, amongst the more conspicuous small birds, mountain bluebird, pipit, Brewer blackbird, and yellow-headed blackbird.

By this route the Columbian ground squirrel may have entered the region—the first were seen at 122 Mile, Lac La Hache, by Mr. Gilbert Forbes in 1928. At any rate an expanding population is now a prominent feature of the roadside fauna. So is the yellow-bellied marmot that burrows under culverts and under the floors of deserted log buildings. Mule deer use the road as an easy trail to and from their feeding grounds and so also in winter do moose. Rabbits, chipmunks, red squirrels, and less conspicuous mammals cross from one side to the other and are prey of coyotes that hunt the road's margin. *In fine* it can be said that at one time or another samples of most of the local fauna may be seen along this road.

Swamp Meadow and Stream Edge

This habitat is centred about a permanent stream through flooded meadow of tall grasses and sedges. In places the stream side is fringed with willow and dogwood, with cattails or round-stem bulrush. On the stream bottom grow pondweeds, *Potamogeton* species; water milfoil, *Myriophyllum spicatum;* hornwort, *Ceratophyllum demersum;* and other submerged flora. The water contains amphipods, molluscs, aquatic insect larvae, and fishes of several species, including lake shiner, *Richardsonius balteatus;* squawfish, *Ptychocheilus oregonensis;* chub, *Mylocheilus caurinus;* and suckers, *Catostomus catostomus* and *C. macrocheilus.*

The San Jose River and Bridge Creek above Horse Lake are typical of this habitat. Its bird fauna is less abundant in species and individuals than is that of the shallow-lake marshes described later. It includes pied-billed grebe, American bittern, several species of ducks, American coot, sora, kingbird, red-winged blackbird, yellow-headed blackbird, long-billed marsh wren, and yellow throat.

Amongst the mammals are mink, beaver, muskrat, meadow mouse, and jumping mouse.

Sedge Meadow

This differs somewhat from the last. It consists of low meadow land flooded in spring and dominated florally by Cyperaceae and certain grasses that form the main source of wild hay used for cattle feed. In most years it

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EXPLANATION OF PLATE I

FIG. 2. *Bonaparte gulls in flight at 105 Mile Lake.* FIG. 3. *The Cariboo Road.* FIG. 4. *Mouse-ear chickweed.*


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is not harvested until August, when flood water has subsided, so that in early summer it provides undisturbed cover for a nesting waterfowl population that includes baldpate, green-winged teal, blue-winged teal, shoveller, Wilson snipe, and others. It is a feeding ground for these, for greater yellow-legs, crows, robins, Brewer blackbird, and red-winged blackbird—to name only a few. A meadow mouse, *Microtus pennsylvanicus drummondi*, is commonest in this habitat.

Willow Swamp

These may be dense thickets occupying the entire floor of a narrow, swampy valley or they may be islands of shrubbery surrounded by low-lying meadow that sometimes continues flooded until late summer. In addition to willows of several species the thickets include red-osier dogwood (*Cornus stolonifera*), dwarf birch, and other species. The flowering plants are those associated with wet ground elsewhere in the region.

The bird population may include Wright flycatcher, cedar wax-wing, orange-crowned warbler, Audubon warbler, yellow warbler, white-crowned sparrow, song sparrow, and Lincoln sparrow—a remarkably mixed association within a small and compact area.

Spruce Swamp

Here and there in the lodgepole pine and aspen forest are swampy depressions dominated by black spruce, *Picea mariana*. Prostrate tree trunks and much of the wet ground are covered with mosses. Flowering plants include grass of Parnassus, *Parnassia palustris;* Canada violet, *Viola canadensis;* and northern rein orchis, *Habenaria obtusata*.

The bird fauna contains elements associated with the subalpine forest such as Franklin grouse, Canada jay, orange-crowned warbler, Wilson warbler, and white-winged crossbill, together with species common to the more open forest. Together they form a highly concentrated population within a limited area.

Marshy Lakes

The most productive marshes are composed of round-stem bulrush in the shallow lakes of the grassland section; the waters are of varying alkalinity. The lakes are not connected with the main drainage systems and hence not subject to flooding so that the water level is fairly well stabilized during the course of any one season. None of the marshes is of great extent; they vary in size from a few acres to 100 acres or more. Some are in the form of a series of discontinuous shoreward strips between open areas of boulders or soft bog. Others encircle the circumferences of small lakes or ponds (Fig. 6); still others, the most prolific in bird life, cover relatively large areas in which open water is restricted to a few narrow channels. Certain small lakes in narrow valleys have their main areas of marsh at the outlets. In several, because of a lowered water table, the outlets have ceased to function as such but through the years humus has accumulated there, thus providing the foundation necessary for a lush vegetation.

The animal productivity varies according to the vegetative element and this in turn is controlled by the chemical constituents in the soil. In some lakes the bottom flora is dominated by ditch-grass, *Ruppia occidentalis*, and by mid-June reaches the surface in dense masses that harbour amphipods and a varied insect life. In others sago pondweed, *Potamogeton pectinatus*, is dominant. Additional elements in the submerged flora, differing in degrees of importance in the economy of waterfowl, are: water crowfoot, *Ranunculus aquatilus capillaceus;* horned pondweed, *Zanichellia palustris;* hornwort, *Ceratophyllum demersum;* water milfoil, *Myriophyllum spicatum;* bladderwort, *Utricularia occidentalis;* and pondweeds, *Potamogeton Richardsonii*, *P. heterophyllus*, *P. pusillus*. The duckweed, *Lemna minor*, is present in many marshes and on some ponds or marshy sloughs covers much of the open water.

The round-stem bulrush, *Scirpus acutus*, is the cover plant of greatest importance in the life of these marshes and the achenes are a highly valuable item in the diet of many waterfowl. So to a lesser degree are the seeds of bur-reed, *Sparganium* sp., and those of a spike rush, *Eleocharis palustris*. The rush, *Juncus balticus*, a valuable cover plant, grows in thick clumps along the inshore edges of some marshes and a three-square bulrush, *Scirpus paludosus*, is the exclusive tall growth along certain sloughs.

Bryozoa occur in some lakes and the statoblasts are consumed in great numbers by mallards, lesser scaup ducks, buffle-heads, and other ducks. Amphipods, *Gammarus limnaeus* and *Hyalella azteca*, eaten by many kinds of birds, are widely distributed and in some small lakes a water flea, *Daphnia magna*, in enormous numbers clouds the waters. These, together with numerous species of larval insects, notably members of the Odonata, and molluscs are essential elements in the economy of the marshy lakes.

In late summer filamentous algae, *Spirogyra* and *Zygnema*, reach a peak of abundance in these stagnant waters; they may envelop much of the submerged growth and cover large areas of a lake's surface, thus creating a hazard to young waterfowl that become entangled in the accumulated mass; death from this cause is not infrequent. Filamentous algae enter the picture in other ways also, being used for nesting material by such different birds as grebe, long-billed marsh wren, and yellow-headed blackbird. At the same season an efflorescence of blue-green algae may darken the waters and form a thick deposit on the rush growth where it meets the waterline.

These marshes are nesting grounds for Holboell grebe, horned grebe, eared grebe, pied-billed grebe, mallard, canvas-back, redhead, ruddy duck, American coot, sora, Virginia rail, black tern, red-winged blackbird, yellow-headed blackbird, and long-billed marsh wren. To them baldpate, pintail,

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EXPLANATION OF PLATE II

FIG. 5. *Typical forest slough.* FIG. 6. *A productive slough in the grasslands at 149 Mile.* FIG. 7. *Aspens at the edge of the grasslands.* FIG. 8. *Bulrush marsh at Straight Lake.* FIG. 9. *An open-shored lake on 108 Mile Ranch.* FIG. 10. *Aspens at Lac La Hache defoliated by forest tent caterpillar and configuration of peninsula at 120 Mile.*


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green-winged teal, blue-winged teal, and shoveller that have nested nearby bring their broods.

Less productive marshy lakes are those with a marl bottom in which cattail, *Typha*, is the dominant emergent growth. The open waters of some are covered with yellow pond lily, *Nuphar polysepala*, while the more valuable food plants, as typified by *Potamogeton* species, are limited in quantity.

Open-shored Lakes

There are a number of small lakes in the region containing chemical constituents in a solution beyond the toleration point of most plant life. Thus some have bare shores (Fig. 9), others are covered with the salt-loving *Salicornia*. Submerged flora is very limited as to both species and quantity. Most of these lakes do, however, contain an invertebrate fauna limited in species but producing an abundance of individuals. Chief amongst the groups represented are fairy shrimps, Phyllopoda; water boatmen, Corixidae; and whirligig beetles, Gyrinidae. In the mud of the shores live the larvae of various diptera, including several genera of midge, Chironomidae. The former provide food for such diving ducks as lesser scaup duck, Barrow golden-eye, and buffle-head, and some or all of these, particularly non-breeding and postbreeding individuals, frequent such lakes in large flocks. In late summer the shoreline insect life attracts many transient waders, the most abundant being greater yellow-legs and lesser yellow-legs (Fig. 12).

Large Lakes

The larger lakes play an important part in the economy of the Cariboo Parklands. A major chain consisting of Bridge Lake, Horse Lake, Canim Lake, and Mahood Lake drains into the Clearwater River, which is tributary to the North Thompson River. Williams Lake and Lac La Hache, connected by the San Jose River, are tributary to the Fraser River.

These are deep lakes with a fish population that includes Kamloops trout, *Salmo gairdneri kamloops;* lake trout, *Cristivomer namaycush;* Rocky Mountain whitefish, *Prosopium williamsoni;* two species of suckers, *Catostomus catostomus* and *C. macrochellus;* squawfish, chub, lake shiner, and ling, *Lota maculosa*. Kokanee, *Oncorhynchus nerka kennerlyi*, are present in several lakes, including Lac La Hache. The latter is representative of this habitat.

Lac La Hache, 10½ miles long by ¼ to 1½ miles wide, elevation 2650 ft., 51° 121° N.E., occupies a narrow valley lying northwest and southeast. For miles on either side lie the parklands made up of the several habitats described earlier. The shores are open in places, where the grasslands slope down to the lake, but in general are featured by a modified form of the prevailing forest type, in which great, old Douglas firs rise high above lesser aspens and lodgepole pine that are present in association and in clear stands. There are sections where black cottonwoods predominate, others covered by shrubbery, others where swampy willow-thickets are separated from a shoreward cattail and bulrush marsh only by a low intervening ridge of ice-borne gravel and debris. Conspicuous amongst the shoreline flora is cow parsnip, *Heracleum*

lanatum, and the tall cover afforded by its summer's luxuriance provides concealed feeding places for ground birds nesting on the littoral. For the most part the beaches are of boulders or gravel; above them the ice-formed ridge is continuous for long stretches of shoreline. The lake, deep for the most part, has wide, shallow reaches extending out from shore for varying distances. This feature, by reason of the contrasting colours—glaucous green over the shallows and rich blue over the depths—can plainly be seen on a clear day.

Indenting the shore are a number of shallow, marshy bays, all very much alike. Three such, the largest about four acres, lie on either side of a long wooded point that juts far out into the lake near 120 Mile (Fig. 10). In two the emergent vegetation is chiefly broad-leaved cattail (*Typha latifolia*) and mixed with it are small areas covered by bulrush (*Scirpus validus*) and bur-reed (*Sparganium americanum*), all growing on a marl bottom. The third, in addition to the half-floating cattail and bulrush bog, contains an inshore area of *Scirpus acutus* and *Juncus balticus*. These marshes are submarginal nesting grounds for waterfowl but because they contain various food plants, notably pondweeds (*Potamogeton pectinatus*, *P. filiformis*), water knotweed (*Polygonum amphibium*), arrowhead (*Sagittaria cuneata*), and dock (*Rumex* sp.), are attractive to ducks on migration. Along some of the beaches grow various grasses and sedges, including foxtail (*Alopecurus geniculatus*), *Carex lasiocarpa*, and *C. Hoodii;* in the shallows close to shore are beds of manna grass, *Glyceria gracilis*.

The lake shore is a highway for a bird migration that is more conspicuous in spring than in autumn. Beginning in late April and continuing through most of May numerous flycatchers, warblers, sparrows, and other small birds linger in the shrubbery and open woods along this route. Later a summer population that includes Wright flycatcher, Audubon warbler, Oregon junco, white-crowned sparrow, and song sparrow, nest there. The marshes attract American bittern, black tern, sora, red-winged blackbird, and long-billed marsh wren, while the open lake is a resting place for transient diving ducks, Bonaparte gull, and other water birds. In summer the loon, bald eagle, osprey, and kingfisher are conspicuous. Barrow golden-eye and American merganser bring their broods from nesting trees not far inland.

Annotated List of Species

Common Loon. *Gavia immer* (Brünnich).—A common summer visitant arriving usually in late April as the larger lakes became free of the winter's ice.

Single pairs occupy small lakes of various types, some with a fish population, others with no fishes present but containing amphipods, molluscs, and insect

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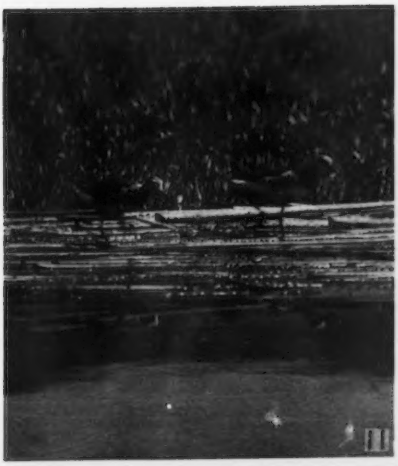
EXPLANATION OF PLATE III

FIG. 11. *A mated pair of Wilson phalarope.* FIG. 12. *Flock of greater and lesser yellow-legs at Mirage Lake.* FIG. 13. *A flock of northern phalarope at Watson Lake.* FIG. 14. *Nest of herring gull with eggs and young at Bridge Lake.*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larvae in varying amounts. The larger lakes, for example, Horse Lake, Deka Lake, and Lac La Hache, each support three or four pairs of loons. In addition to the nesting birds there is another part of the population that, perhaps because of sexual immaturity, does not breed. Because many mated pairs are not successful in raising young and successful parents more often have one rather than two young, the yearly increase is slight; the population is approximately the same from year to year.

Nests are constructed of round-stem bulrush or cattails and may be on a lake shore or anchored amongst floating vegetation some distance out. An unlined depression in the rotted vegetation of an old muskrat house is another type of nest. Mated birds remain within their chosen territories until the young are nearly full-grown and the same territories are occupied in successive years. Dates for nests with eggs are: Horse Lake, May 30, 1937; Williams Lake, June 2, 1942; Lac La Hache, June 28, 1942.

Holboell Grebe. *Colymbus grisegena* Boddaert.—Common summer visitant, arriving in April and the majority leaving in September; the earliest date of arrival recorded is Apr. 17, 1941, at Lac La Hache, and the latest date seen is Oct. 12, 1933, at Buffalo Lake.

Nests with eggs have been examined at Horse Lake, Lac La Hache, Williams Lake, 103 Mile Lake, 105 Mile Lake, and other of the larger lakes that include marsh areas of round-stem bulrush. This plant in partly decomposed form is the chief constituent in many nests that may also include green pondweeds (*Potamogeton* species), widgeon grass, and other water plants.

Details of this species' behaviour and food have been recorded in an earlier paper (14). The paper in question gives a detailed account of an unusually tame individual that nested on 105 Mile Lake in 1941 and it is of interest to record that in 1942 a pair nested on the same territory, close to the site of the last year's nest. The bulrush cover, heavy in the previous year, had been reduced by winter grazing and the nest with the incubating bird on it was visible for some distance. It contained five eggs on June 3. When I approached the nest and was within 60 ft. of it the female swam out on the lake, then returned and for some time continued to swim back and forth, seldom more than 50 ft. away. The only call given was a sharp, clicking sound. Three hours later, when the nest again was visited, the female was incubating and allowed an approach within a canoe-length before she slid off, dived, and reappeared 100 ft. away. She remained in the vicinity for the next half-hour, preening and occasionally giving the braying call. The male did not appear. When the nest was next seen, on June 17, none of the eggs had hatched. The female, still unaccompanied by a male, again showed little evidence of alarm when closely approached.

Again, in 1944, this territory was occupied by a pair that exhibited no signs of fear at human intrusion. On May 3, they were nest-building in a desultory fashion while two of us sat on top of a bank in plain view, less than 40 ft. from the nest. For a time the birds dressed their plumage and idled on the water

near the nest; then one, probably the female, swam off for 50 ft. or so and returned, dragging a piece of rush, which she placed on the nest. A few minutes later she dragged in a piece of widgeon grass and added it to the pile. The male remained fairly close to her during these activities but contributed nothing to the nest. Several times both opened their bills wide and together gave the characteristic braying call. Finally both swam slowly away from the nest and disappeared along the shore.

During a circuit of 105 Mile Lake on June 3, 1942, four occupied nests, in addition to the one referred to earlier, were examined; these contained three, four, four, and five eggs, respectively. All were made of rotted round-stem bulrush with some green stems added and a surface layer of widgeon grass, water milfoil, and, in one, filamentous algae. One nest with four eggs contained also the shell of a fifth, which recently had hatched; it was broken into two pieces and the smaller piece was telescoped into the larger. The chick was not found. The female to which this nest belonged flapped out from the shelter of a bulrush island then dived and was not seen again. At none of the other three nests were the birds observed and in each the eggs were covered. By June 17 most of the eggs had hatched. One still contained three eggs, while two chicks were in the water close by and the female about 100 yd. distant. Another female when first seen was at the edge of a marsh and carried three large young on her back. She dived and left the young struggling to right themselves in a floating mass of filamentous algae.

At the end of a marshy bay at Sheridan Lake, July 29, 1943, I came suddenly upon an adult with one large young. The adult dived and swam under water for a distance of at least 100 yd. to reach the entrance of the bay, where it emerged and called several times. In swimming out of the bay the bird was fully visible in the clear water; it moved very rapidly in a straight line; the body seemed rigid, with wings held tightly to the sides; the movement of the feet was barely visible.

In 1943 the population was smaller than it had been in the two previous years and there was a high mortality amongst the young. The following is a tabulation of populations studied:

Locality	Date	No. of adults	No. of young
105 Mile Lake	July 13, 1943	10	6
Elliott Lake	July 15, 1943	1	0
Horse Lake	July 18, 1943	5	0
103 Mile Lake	July 21, 1943	4	0
Williams Lake	July 25, 1943	1	1
Sheridan Lake	July 28, 1943	5	3

Horned Grebe. *Colymbus auritus* Linnaeus.—Common summer visitant, arriving in late April and early May, the earliest date recorded being Apr. 22, 1941.

Near Clinton on Apr. 28, 1943, it was observed that one of a mated pair still carried much of the winter plumage, in sharp contrast to its mate, which was in full breeding dress. The spring migration in that year probably was at its height during the first week in May. A migrating flock of six appeared on Lac La Hache, May 2; the following day 17 in three flocks on Williams Lake and a flock of six on Cummings Lake were counted. All were in summer plumage. The former were asleep on the water at about 11.00 a.m. Near to them, and also asleep, were smaller numbers of baldpate (*Mareca americana*), lesser scaup duck (*Nyroca affinis*), and surf scoter (*Melanitta perspicillata*).

Nests are located more often on small ponds and marshy sloughs than on the larger lakes and local populations fluctuate from year to year. Thus in 1941 only one pair was observed on the numerous sloughs on Springhouse Prairie, while between May 18 and May 29 the following year four pairs were seen daily. None had established a territory up to the end of this period. Conversely a reduction of population took place on 103 Mile Lake, where five pairs had nested in 1941 and only one pair in 1942 and 1943.

Details of nesting and behaviour have elsewhere been recorded (14).

Eared Grebe. *Colymbus nigricollis* (Brehm).—Summer visitant, nesting in small numbers on numerous lakes west of that portion of the Cariboo Road between 100 Mile and 150 Mile. Colonies of 45 pairs have been recorded from Sorensen Lake and Westwick Lake, about 18 miles south of Williams Lake village (14).

A total of 80 was counted on Westwick Lake, May 20, 1942. Approximately half of this number was scattered over the main body of the lake, the remainder on open water in the vicinity of the round-stem bulrush marsh at the south end. On this date about a foot of water was in the marsh and the old growth of bulrush, partly bent over and broken down in places, provided thick nesting cover. Through it momentary glimpses of other eared grebe were obtained as they swam along narrow marsh-channels leading from their nesting colony to open water.

This colony was confined within a space roughly 15 ft. by 20 ft. and consisted of 23 nests made exclusively of soft, blackened rush stems resting on the water in, or close to, thick clumps of dead rushes. Some were in groups of three or four (Fig. 15). One such group was centred about a wide bulrush clump—one nest in its centre, two a foot apart on its outer edge, the other four feet from it on the opposite side of a narrow channel. Another group of six nests, situated on both sides of a four-foot channel, was included in a space 5 ft. by 8 ft.

Six of the 23 nests were empty; the remainder contained eggs as follows: 3/1, 3/2, 6/3, 4/4, 1/5. In some nests the eggs were dark olive-buff, indicating advanced incubations, others were less dark and some were fresh and not discoloured.

The only nest examined in 1943 was at Cummings Lake, July 22. This contained two eggs advanced in incubation and was unusual in situation as

well as in the materials used. The site was a small clump of round-stem bulrush 10 ft. from shore and surrounded by open water. The floating nest was made of green bulrushes, to which a few old, blackened stems had been added, and fresh sago pondweed covered the upper surface.

Western Grebe. *Aechmophorus occidentalis* (Lawrence).—A summer visitant to Williams Lake; it has been found nesting nowhere else in the Cariboo Parklands. Earliest recorded date of arrival, Williams Lake, Apr. 25, 1943; latest date seen, 108 Mile Lake, Oct. 22, 1938—12.

A history of the colony up to the year 1941 is recorded elsewhere (11, 14). In 1942 the colony comprised 40 pairs, and on June 5, 18 nests were examined. These were situated at the outer edge (i.e., the lake edge) of a round-stem bulrush marsh in which the old growth was broken down and the new growth not tall enough to provide much cover. All the nests were large, the main structure a floating platform of round-stem bulrush, measuring 4 ft. or more in diameter. At or near the centre a mass of bladderwort formed the nest proper. Eight nests were empty, the bladderwort flattened through use and dried to brittleness by the sun; in some of these the presence of egg-shell fragments provided evidence that hatching had been successful. One contained a single chick and the shell from which it emerged; in another was one chick not quite out of the shell (Fig. 19). A third nest contained one egg and one newly hatched chick and in another the single egg was on the point of hatching. Other nests contained eggs as follows: 1/1, 3/2, 3/4; one of the latter also contained a single egg of American coot, *Fulica americana*. In none were the eggs covered.

Pied-billed Grebe. *Podilymbus podiceps* (Linnaeus).—Summer visitant, nesting on marshy lakes in the same habitat occupied by Holboell grebe and eared grebe. It has been reported from numerous localities (14).

At 149 Mile Slough, June 22, 1942, a nest contained one egg of this species and one of the ruddy duck, *Erismatura jamaicensis* (Fig. 17). The latter was probably a year old and the contents had dried up. Both eggs were stained the same uniform shade of olive-buff, a condition characteristic of grebes' eggs after a week or so of incubation.

White Pelican. *Pelecanus erythrorhynchos* Gmelin.—Transient and occasional summer visitant to the territory covered by this paper. One was seen on Alkali Lake, June 5, 1937, and in 1941 it was reported by a resident there that pelicans visited the lake frequently. According to information given to Rhoads in 1892 white pelicans had formerly been common on Lac La Hache

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EXPLANATION OF PLATE IV

FIG. 15. *Nests and eggs of eared grebe at Westwick Lake.* FIG. 16. *Nest and eggs of Canada goose at 108 Mile Lake.* FIG. 17. *Nest of pied-billed grebe containing one egg of this species and one old egg of ruddy duck.* FIG. 18. *Nest and eggs of green-winged teal at Springhouse Prairie.* FIG. 19. *Western grebe chick emerging from egg.* FIG. 20. *Nest and eggs of cinnamon teal at Springhouse Prairie.*


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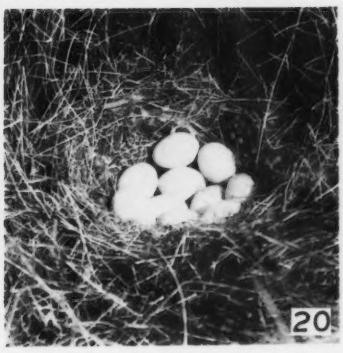
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during migration; apparently they had ceased to be so some years earlier. I have seen none on this lake.

There is a nesting colony at Stum Lake in the adjacent Chilcotin, where eggs and young were photographed by Jobin on July 1, 1939. Pelicans are seen on other lakes in the Chilcotin district, as at Maxwell Lake, where a flock comes regularly to fish. Mr. F. M. Shillaker has supplied information concerning dates and numbers seen there in 1941 as set forth below:

May 3—7; May 6—10; May 7—20.
June 1—8; June 2—10.
July 27—14, largest count during July.
Aug. 6—8, largest count during August.
Sept. 2—15; Sept. 3—8.

Great Blue Heron. *Ardea herodias* Linnaeus.—A postbreeding dispersal from an undiscovered nesting ground brings a small population of great blue heron to the Cariboo Parklands; it does not nest in the region. No specimens have been taken so the subspecific status of these birds cannot be determined at this time but very likely they belong to the maritime race, *Ardea herodias fannini* Chapman. The distance from Williams Lake to the sea coast is approximately 190 airline miles west.

There are eight sight records for localities along the Cariboo Highway between 100 Mile and 122 Mile; one refers to two birds in company, the remainder to single individuals. The earliest date is July 30, 1931, the latest Oct. 1, 1940. In addition to these one was seen at Horse Lake, Aug. 23, 1936, one at Clinton, Aug. 24, 1936, and one at Buffalo Lake, Sept. 8, 1932.

American Bittern. *Botaurus lentiginosus* (Montagu).—Summer visitant, never plentiful, to many marshy lakes. It has been seen, more or less regularly, at Horse Lake, Lac La Hache, San Jose River, Williams Lake, and Jones Lake and once at 150 Mile Lake, Succour Lake, Alkali Lake, and Brunson Lake. For three consecutive years one was heard 'pumping' in a bulrush marsh at 121 Mile, Lac La Hache, but none has been found nesting there. The earliest appearance was recorded at that place on May 2, 1943. Seen regularly at Buffalo Lake in 1932 and 1933, the latest date being Oct. 5, 1933. Mr. L. Jobin discovered a nest with six eggs at Jones Lake, May 29, 1943, and photographed it on June 19, when all the young had hatched. Another nest with four eggs at Williams Lake was photographed by him on June 18, 1939.

Whistling Swan. *Cygnus columbianus* (Ord).—Common spring transient, arriving in late March and early April. In 1940 a flock of 60 ± remained on Westwick Lake for approximately three weeks. According to old local residents at Springhouse Prairie the largest migration ever seen by them took place in the spring of 1941. There in late March, flocks alighted on the narrow ribbons of open water along the shores of otherwise ice-covered lakes and one flock of 75 was counted on Boitano Lake, Mar. 21. It was said also that a few remained there until Apr. 18. Mr. P. W. Ogden reported seeing a

flock of 50 on 103 Mile Lake, Apr. 2, and Mr. Gilbert Forbes saw between 30 and 40 on Lac La Hache, Apr. 16; these and two others seen on 103 Mile Lake the same day were the last recorded that spring. Mr. Forbes stated also that in 1942 a flock of 22 spent several days, approximately Apr. 15 to Apr. 18, on a strip of open water at Lac La Hache. The following year Mr. J. Stewart counted a flock of 100 ± on Green Lake, Apr. 23, and at Lac La Hache approximately the same number in six flocks passed over between Apr. 22 and Apr. 26. Reports of a still larger spring migration in 1944 have been received. For example, Ogden estimated the number on 103 Mile Lake to be 200 on Apr. 7.

Records of a flock of seven seen flying over Buffalo Lake on Oct. 17, 1933, and another flock, in which the individuals were not counted, seen at the same place the following day represent the only information concerning an autumn migration.

Trumpeter Swan. *Cygnus buccinator* Richardson.—Probably a regular transient in small numbers. There is one definite record. During the period May 12 to May 14, 1942, an adult remained in a marshy bay of Lac La Hache near 122 Mile. Here it frequently was seen at close range, resting on the beach or feeding in the shallows close to shore with foreparts submerged as it tipped up in the manner of a feeding pond duck. On one occasion, when disturbed by my sudden appearance on the shore, it swam slowly out on the lake and while doing so gave the familiar guttural call several times.

On Apr. 29, 1943, five adult swans, believed to be this species, on 108 Mile Lake were examined through 6 × binoculars at a distance of about 150 yd. With them was another much smaller, a dark-coloured bird of the previous year, that was identified as a whistling swan. All were nervous and they took flight when approached; none made any vocal sound when rising nor could any sound, other than that made by their wings, be heard as they passed in flight.

Canada Goose. *Branta canadensis* (Linnaeus).—Common summer visitant, arriving in April, occasionally in late March before the ice goes out of the lakes. This was so in 1941 and again in 1944. During the last week in March of the latter year, Mr. P. W. Ogden estimated the number in a concentration of flocks at Elliott Lake to approximate 2000. It nests in many localities and shows preference for sites on the small islands that feature many of the lakes in this district. Certain islands are occupied each season and sometimes the exact site is used in successive years.

The population at Beaver Dam Lake near Clinton, May 11, 1939, consisted of four pairs and 12 ± non-breeding birds. Two nests, one containing six eggs, the other three, were built amongst dwarf birch close to the water's edge on a small island. Both contained a large quantity of down and this material was scattered here and there on the bushes and on the ground for several feet around the nests. A slight excavation in loose earth and dead leaves near the nest containing six eggs formed the resting place of the gander. When a

canoe was paddled close to the island the goose, followed immediately by the gander, burst through the bushes and both alighted near the centre of the lake several hundred yards distant. Only the goose was at the second nest; on being disturbed she flew, honking loudly, to open water and alighted there. The gander, attracted by her calls, rose from the mainland shore and joined her on the water.

Another population nests on islands in Sheridan Lake; five nests containing from five to seven eggs on May 16, 1939, were examined by Mr. J. Stewart.

A small boulder island (40 ft. by 20 ft. on May 11, 1939) in 105 Mile Lake is used yearly by a single pair. On the above date the goose was seen on the nest so completely relaxed that her back stood level with the nest's rim of down while her neck extended its full length on the ground in line with her body. The nest, which contained six eggs, stood amongst small boulders between the water's edge and a patch of loco-weed and other vegetation above high-water mark. When flushed, at a distance of no more than 20 ft., the goose joined the gander on the water several hundred yards away and a few minutes later both flew past, close to the island. On Apr. 22, 1941, the nest on this island contained two eggs covered by the dry grass with which it was made—up to this time no down had been added. When it was next examined on May 28 the eggs had just recently hatched; the flattened nest contained a large amount of down. The presence of fresh droppings from the adults suggested that the young had been led away a few hours earlier. The family was not located although a careful search around the lake was made. In 1942 a nest, of dry grass with down added to the rim, had again been built in the open and held seven eggs on May 12. The goose rose from it when a canoe was paddled within 20 yd. and almost immediately the gander came from a distant part of the lake and joined her. Shortly afterwards both left the lake. The eggs hatched about May 28 and the family was not seen subsequently.

In 108 Mile Lake, five small boulder islands, evidently a product of ice action on a shallow reef, lie close together a short distance off shore. One of the larger, 150 ft. or so in length, and supporting a few small aspens, grasses, and forbs, and a smaller one with less vegetation are used each year by nesting geese. On May 13, 1942, two occupied nests were examined. One, in an open situation and containing five eggs, was made of dry loco-weed and a large quantity of down (Fig. 16). As I approached the island and reached a point about 40 ft. from it the incubating goose raised her head and a moment later stepped off the nest, walked to the shore a few yards away, and from there took flight. The gander from a distance of several hundred yards called repeatedly and later joined the goose in flight. The second nest, also in the open, was of similar construction and held seven eggs. The sitting goose flushed at about 30 yd.; the gander did not appear.

It was observed on July 24, 1943, that three pairs had nested that year on the islands. Examination of one nest revealed several layers of tightly packed

down, broken egg-shells, and debris—each layer probably representing a year's accumulation of nest material.

A nest on an old, flattened muskrat house in a round-stem bulrush marsh in Westwick Lake was made of bulrush stems, with its upper surface eight inches above the water. No down had been used. It contained six eggs on May 20, 1942. The goose was flushed from it; the gander stood 50 yd. away on the muddy shore of the beach. The eggs had hatched when the nest was next visited on May 23.

Often the presence of Canada geese is not readily detected after the young have been led from the nest. Some families may travel a considerable distance to a place where there is ample cover, such as that afforded by a willow swamp, of which there are many. Others return to the vicinity of the nest if it is adjacent to cover and grazing. This is so at 108 Mile Lake. Here, on July 24, 1942, accumulated droppings, some quite recent, and numerous primary and secondary wing feathers scattered over two grassy points indicated regular occupation over a long period. The months of June and July cover the time of moult and the flightless period, when both the breeding and non-breeding members of the population seek seclusion. In August they appear again in the open and may be seen in flocks grazing in the meadows or on grassy hillsides. Thus on Aug. 25, 1937, two flocks totalling 50 occupied a grassy flat alongside 105 Mile Lake.

Although this midsummer seclusion is general, family groups frequently are met with. Thus at Watson Lake, June 23, 1943, a family consisting of both parents and six large young swam down the centre of the lake, one parent in advance, the other to one side of the young that swam in single file. The young appeared only slightly smaller, but very much darker in colour, than the adults and their white cheek-patches were less conspicuous.

Lesser Canada Goose. *Branta leucopareia* (Brandt).—Regular and abundant transient, passing through in spring at the time when *canadensis* populations are nesting or preparing to nest. On Apr. 16, 1941, a flock of 60 ± on the shore of 103 Mile Lake attracted a passing flock of equal size that circled several times and then alighted amongst them. When disturbed a few minutes later all rose and flew out over the lake, then, circling several times to gain altitude, proceeded north in a crescent-shaped formation. Two days later a flock of 80 ± was watched through binoculars as the birds grazed on an open hillside above Boitano Lake. Other flocks noted that year were: 100 ± flying over Lac La Hache, Apr. 20, at 7.30 p.m.; seven on slough at 108 Mile, Apr. 22; 13 on shore of small lake near Clinton, Apr. 24. When this last flock was flushed it circled the lake, then flew north high over the tree tops on the summit of the ridge overlooking the lake. The latest spring record is for three seen at 103 Mile Lake on May 1 and May 5, 1943.

Information is lacking regarding the autumn migration, which is reported to reach a peak in late October.

Cackling Goose. *Branta minima* Ridgway.—There is a regular migration of the cackling goose through the Cariboo Parklands, where it is known, to the more observant local hunters, as "brant." The route followed by it from the sea coast to the interior plateau has not been identified. A series of lakes about 15 miles north of Clinton is the most southerly interior point where it has been recorded in numbers and south of this, at such interior points as Kamloops, Nicola, and Okanagan, it is rare and is unknown to local hunters.

On Apr. 20, 1940, a flock of 100 ± was observed flying over Lac La Hache and in that year Mr. P. W. Ogden reported seeing flocks that totalled between 300 and 400 passing over 70 Mile at 7.00 p.m. on Apr. 23.

Four flocks that together numbered approximately 100 were on Sorensen Lake on Apr. 18, 1941, and on Apr. 20, a flock of 70 flew north over Lac La Hache. Later it was learned that those on Sorensen Lake remained there for two weeks and each day fed over a stubble and a freshly-ploughed field.

In 1942 and 1943 only the last of the migration was witnessed; a flock of 15 on Sepa Lake, May 13, and three flying over 149 Mile Slough two days later, were the only birds seen in 1942. The following year at 121 Mile, Lac La Hache, in the early morning of Apr. 30, a total of 70 flew north at a height of approximately 600 ft. above the ground. They travelled in the following units, namely, 38, 28, 6, 2 and passed in less than five minutes. The second flock was about 100 yd. behind the first, the remainder followed at a greater distance and all took exactly the same course. Precise information concerning the autumn migration is lacking.

White-fronted Goose. *Anser albifrons* (Scopoli).—A scarce transient. The only record is a young male, *A. a. albifrons* (Scopoli), collected at Buffalo Lake, Oct. 15, 1934, by Mr. E. M. Tait.

Lesser Snow Goose. *Chen hyperborea* (Pallas).—On Apr. 20, 1925, a flock of 18 was seen by Constable H. P. Hughes of the British Columbia Police on Little Bridge Creek near 100 Mile. A careful description of the birds, contained in a letter written to me by Mr. Hughes a few days later, is the basis for this identification. None was reported subsequently until the spring of 1944, when a migration involving a number of small flocks was generally observed. On Apr. 21 Forbes saw a flock of 30 flying up Lac La Hache at 122 Mile and on Apr. 30 Ogden saw a flock of 30 in flight at 117 Mile. Jobin reported that a flock of 10 arrived on the west end of Williams Lake early in April; these were still there when I visited that place on May 4. On the morning of the same day I watched three on an open slope near 130 Mile where the first green grass was showing. They were observed there again at 5.45 p.m. and a fourth bird fed along the bank of the San Jose River some 200 yd. from them. The band of three was again on the same slope on May 6.

Ross Goose. *Chen rossi* (Cassin).—Included on the basis of a sight record at 149 Mile Lake, May 15, 1942, when a small white goose, seemingly little

larger than the mallards with which it associated, was examined through 6× binoculars at a distance of approximately 75 yd.

Mallard. *Anas platyrhynchos* Linnaeus.—Abundant summer visitant, arriving in early April. It nests in numerous types of habitat that include bulrush marshes and brushy thickets close to water. A nest at Lac La Hache, containing 11 eggs and a quantity of down on May 4, 1943, was well concealed under a gooseberry bush growing on a steep, brush-covered slope rising 20 ft. above the lake margin. Other dates for nests with eggs are: Westwick Lake, May 20, 1942; Springhouse, May 22, 1942; Lac La Hache, May 28, 1942.

The earliest record for downy young is June 1, 1942 (21). The average number of young in 84 broods was 6.2.

In the winter of 1939-40 approximately 50 wintered on the San Jose River between Lac La Hache and Williams Lake. That winter was one of relatively high temperatures that permitted stretches of fast water in this small stream to remain open.

Gadwall. *Chaulelasmus streperus* (Linnaeus).—Rare summer visitant, included on the basis of the following sight records, viz.; Horse Lake, July 29, 1936—3; 103 Mile Lake, Aug. 3, 1936—1; Williams Lake, July 4, 1938—1; Tatton Lake, July 21, 1938—1.

There are no records of it nesting in the Cariboo Parklands. In southern British Columbia downy young have been recorded at Swan Lake, Aug. 4, 1932, and at Goose Lake, Aug. 10, 1919. Both these places are near Vernon. It is reported to nest in eastern Washington, does so commonly in southern Alberta, and is plentiful during September and October in the Okanagan Valley. This autumn population in southern British Columbia apparently does not come from northern parts of the province and its place of origin can only be conjectured.

Baldpate. *Mareca americana* (Gmelin).—Abundant summer visitant, arriving later than either the mallard or the pintail. In 1941, during the period Apr. 15 to Apr. 17, baldpate were not plentiful, the largest number seen in one day being 30 on 103 Mile Lake. By Apr. 18 the number had increased and on Apr. 22 at 105 Mile Lake 200 were counted.

Nests are more often situated in *Carex* meadows than elsewhere and generally are close to water. One with eight eggs on June 4, 1942, was in a strip of brome grass, 30 ft. wide, between a ploughed field and the marshy shore of Sorensen Lake.

The earliest date for downy young is June 18, 1941; the average number of young in 98 broods was 6.2. The largest brood contained 12 and the smallest two.

Pintail. *Dafila acuta* (Linnaeus).—Abundant transient and common summer visitant. The main spring migration takes place in late March and in April. Nests sometimes are situated in bulrush marshes but more commonly in dry places, occasionally as much as 300 or 400 yd. from water (22). Dates of

nests with eggs are: Sorensen Lake, May 20, 1942; Springhouse, May 21, 1942; Horse Lake, May 28, 1937; Clinton, June 7, 1937; Springhouse, June 11, 1941, June 12, 1941, June 17, 1941.

The earliest record for downy young is May 31, 1937; the average number of young in 29 broods under observation was 6.1.

Males that have remained in close companionship with their mates during the laying period leave them when incubation commences and gather in small bands. At this time they are restless, moving from one slough to another—a behaviour contrasting with their marked sedentary habit during the earlier part of the nesting period. Before long some of the postbreeding males, together with a smaller number of non-breeding females, move south. It has been observed that some of the males at this time show evidence of eclipse, although the moult involving the flight feathers has not commenced. With these early migrants this moult evidently takes place in more southern latitudes. A southern flight composed of the remainder, or a greater part of the nesting population, is usual in late September. The main migration, composed of birds from more northern latitudes, passes through in late October.

Green-winged Teal. *Nettion carolinense* (Gmelin).—Abundant transient and common summer visitant. The northern migration takes place in April and by the first week in May most of the transients have left. In 1938 what appeared to be about the last of the spring flight was observed Apr. 29, at White Lake, where 247 were counted.

The earliest record of a nest with eggs is May 10, 1943; it was situated under a clump of dwarf birch 30 yd. from the shore of a marshy bay at Horse Lake and contained four eggs on May 10 and six eggs on May 13. Another nest, on Springhouse Prairie, with eight eggs on July 8, 1941, was built in dry sedge growth 100 ft. from a small slough (Fig. 18). The earliest date for downy young is July 3, 1938; the average number of young in 50 broods was 6.6.

The following observations of behaviour were made in 1938. On July 7, in a small bay near the mouth of the shallow, marshy outlet of Exeter Lake, I suddenly came upon a group of 19 young, about three-quarters grown, and three adult females. The young birds made off down the creek and the three females rose and dropped again to the water a few yards in front of my canoe. Here all together they made the demonstrations usual to females with young—flapping over the water with necks outstretched then turning in a wide circle to approach the canoe. All three birds came back and repeated this performance a dozen times or so during the following 10 min.; in the meantime the young had passed out of sight down the marshy creek. This pooling of broods was again noted on July 18 at Pete Kitchen Lake where three females accompanied 14 half-grown young. At Mirage Lake on Aug. 1 one female led a brood of 13, another a brood of seven, while a third was accompanied by a single young; all these were about three-quarters grown.

The first flying young were encountered on July 22 and additional flying young appeared during the week following. As with the mallard, the broods tended to associate in small flocks at this time.

Several drakes moulting into the eclipse were recorded at Tatton Lake on July 5, and a flightless male, only partly eclipsed and showing conspicuously the reddish-coloured feathering on the face, was observed at close range on July 13.

Blue-winged Teal. *Querquedula discors* (Linnaeus).—Summer visitant, usually less common and showing greater fluctuation in size of population than the green-winged teal. Unlike that species it is late in reaching the nesting grounds, not arriving before late April or the first week in May—none was seen there so late as Apr. 25 in 1940 and Apr. 23 in 1943. The latest recorded appearance is 103 Mile Lake, Oct. 3, 1940—12.

On July 15, 1943, a female was flushed from a nest containing 11 eggs, situated in a clump of green grass about 10 in. high growing in an open space amongst aspens 200 yd. from a large slough on the 108 Mile Ranch.

The earliest date for downy young is July 2, 1941. The average number of young in 30 broods was 6.9.

The actions of a blue-winged teal with young at 103 Mile Lake have been described elsewhere (7). It is perhaps a coincidence that on Aug. 2, 1937, a female with a brood of seven downy young was present in the same area of this marsh and her behaviour under observation was similar to that previously recorded. This family was swimming in a dense surface foliation of sago pondweed and when I approached the female she moved rapidly in a circle, half out of the water and, with quick wing beats on the surface, circled about the bunched downy young. Sometimes she lay flat on the water and with neck extended rushed across the weed-obstructed surface; at no time did she take wing. This brood had not been reduced in number on Aug. 20, when the lake was next visited.

In 1938 the first brood, comprising eight downy young about one week old, was recorded on July 13. On July 18 three other broods were swimming about 30 yd. apart near the centre of a small marshy lake. One female left her brood to join another female that was trailing her wings along the water a few yards in front of my canoe and the two then acted in precisely the same manner—flapping over the water, rising to fly a few yards, then alighting on the water again to resume, half-submerged, the threshing of the surface with their wings.

A brood of seven downy young, hatched within a day or so, was observed on a small slough on Aug. 4. This female exhibited none of the usual maternal reactions but swam slowly amongst a thick growth of lily pads with the small young struggling hard to keep up with her. The first band of flying young, totalling 22, was recorded on Aug. 15.

Four adult males were noted on 103 Mile Lake on July 3, 10 on Tatton Lake, July 5, and three on Lily Pad Lake, July 6; these were about half moulted to

eclipse plumage. The first flightless adult drakes, apparently only partly eclipsed, were observed on July 8 at 150 Mile Lake; other partly eclipsed males that had not commenced the moult of the flight feathers were flushed on Westwick Lake, July 9.

Cinnamon Teal. *Querquedula cyanoptera* (Vieillot).—In the Cariboo Parklands the cinnamon teal is probably near the northern limit of its distribution. Here it is always scarce; the numbers vary from year to year and some years none has been recorded.

At Tad Lake, May 11, 1939, a pair was observed in display flight and possibly these nested in the vicinity. In 1940 two young of the year were collected at 105 Mile Lake on Aug. 13. In June, 1941, an adult male, probably representing a nesting pair, was seen a number of times on a small pond at 148 Mile, and at Springhouse Prairie a pair was the subject of frequent observation from June 8 to July 9. The territory of this pair was on a small slough situated in hayland protected from grazing. Earlier years of drought had reduced the water surface about one-half and during the period of observation it approximated 10 acres. A narrow belt of round-stem bulrush on one side, and on the other a shoreline marsh of sedges, rushes, including *Juncus balticus* and *Eleocharis palustris*, and grasses had dried out. An abundance of gastropods in the water and sufficient nesting cover made this slough attractive to pond ducks. The following summarize the observations of cinnamon teal at this place.

On June 11 the male was floating motionless on the pond about 20 ft. from shore when the female flushed from a nest containing eight eggs. The nest was of dry sedge leaves and a small amount of down well concealed in a clump of sedge 50 ft. from the water. The female flew directly to the pond; the male rose, alighted beside her and immediately commenced bowing. This proved to be the usual behaviour when on succeeding days the female was flushed from the nest.

June 12. Nest contained nine eggs; female excreted on them as she flushed. On the pond the pair was approached by a second male, which was promptly driven away by the mated male. This unpaired male, or another, visited the slough several times during the ensuing week and was seen once, accompanied by a male blue-winged teal, on another slough aboutthree miles distant.

June 15. Both birds on pond at 10.00 a.m.; nest contained 10 eggs (Fig. 20).

June 19. 9.00 a.m. Eggs completely covered; female was not seen.

June 20. 10.00 a.m. Eggs covered; the pair on slough.

June 21. 5.00 p.m. Pair together on pond.

June 22. Female not on nest at 9.00 a.m.; flushed at 10 ft., 4.00 p.m.

July 7. 5.30 p.m. Female flushed at four feet; two eggs were hatched.

July 8. The male, in full eclipse, on pond. At 8.15 a.m. the female, brooding 10 young in the nest, flushed at two feet. One moment the young

were huddled together—a small heap, striped yellow and olive—the next they had vanished in the grass. The female alighted on the pond in front of the nest and began quacking softly but the young were not seen again at that time. At 7.00 p.m. female and brood were on the pond and retreated into the grass on shore when approached. As I drew near to their place of concealment the female flew to the water and fluttered across it but made no other demonstration.

In the evening of July 7, when two eggs had just recently hatched, the halved shells of each were in the nest. The following morning, after all had hatched, only several small pieces of egg-shell were in and beside the nest.

The following year, on May 19, two pairs were on this slough now containing a much larger area of water than it had the previous year. Between 2.00 and 3.30 p.m. the four birds swam restlessly on the open water, the pairs usually some distance apart; they did not feed during this period. Some degree of hostility between the two males was exhibited. For example, one left its mate and swam toward the other male, which was loafing in the shallows at the edge of the now flooded marsh. When they came close together both stood upright, their breasts almost touching, and each struck vigorously at the other—apparently with the carpal angle of the wing. Although this violent buffeting lasted for several minutes the precise nature of the blows was not clearly seen because of the spray thrown up by the rapidly beating wings. Finally the intruding male withdrew into the flooded sedges; the other, with neck stretched upward, commenced bowing rapidly as it swam alongside its mate. A moment later the male that had intruded upon this pair, still some distance away and partly hidden in the sedges, also began bowing. Later both pairs were on open water close together, one male bowing, the other preening. The females did not respond in any manner so far as could be seen. Another time one male stood on the lower rail of a fence that crosses one end of the slough while the female swam concealed in the marsh below. The second pair swam toward them and as they glided along the female kept up a continuous thin and high-pitched quacking.

These, or different pairs, were seen on other Springhouse Prairie sloughs at this time. On one occasion the male of a pair close together near shore was resting and preening while the female, moving restlessly about, made a thin, nasal quacking almost continuously for 20 min. This was of two distinct sounds, the first soft, the second harsh, as suggested by the syllables *coo-ack, coo-ack*. At times the first sound was guttural, as *cow-ack, cow-ack*. Again the two sounds slurred together into the conventional duck quack. Later both birds swam slowly across the pond, the male with bill submerged at an angle that kept the neck above the water, the female still quacking.

At other places also cinnamon teal were more plentiful in 1942, being recorded as follows: Williams Creek, May 29, one pair; Lily Pad Lake, June 1, one pair; 149 Mile Lake, June 12, two males; 105 Mile Lake, June 17, one male.

Shoveller. *Spatula clypeata* (Linnaeus).—Common summer visitant; earliest records of arrival are not available. In the period Apr. 16 to 23, 1941, a few were on each of many sloughs visited, the largest number in one place being 20, Apr. 20, 149 Mile Lake. On Apr. 28, 1943, a flock of 28, in company with 120 pintail, at 72 Mile was on migration, as were 20 at Lac La Hache, Apr. 30.

Courtship display has been observed at 149 Mile Lake, a favoured nesting place, as early as Apr. 28 (1941) and as late as June 12 (1942). On the former date a pair on the water faced each other a foot or so apart, bowed slowly several times, then took flight, the female in the lead. On the latter date a pair in courtship flight were joined by three other males; these accompanied the pair for a short distance and then returned to the water.

In the latter part of May, 1942, courtship flights on Springhouse Prairie were seen frequently. Thus on May 18 between 10.00 a.m. and 11.00 a.m. a trio were in the air at least six times; on May 21 a pair flying was joined by a second male and the trio circled in a rapid, twisting flight that soon took them out of sight behind a grassy knoll. Sometimes groups composed of two females and three males or even larger units took part in these exercises. At another slough on the same day a pair was together on the water at 9.00 a.m.; at 3.00 p.m. the male was alone, motionless amongst the flooded sedges. On May 26 the pair was together from 10.00 a.m. to 11.00 a.m.

Males remained on their territories and the females continued to visit them there after incubation was well advanced. With one pair this association was maintained after the nine young had been brought to the water. This family was seen on the same small slough several times between June 17 and June 23. On this last date the young were approximately 10 days old. The white underparts of the male were mottled with eclipse feathers. Neither parent left the brood even under stress of fear caused by my close approach in a canoe.

Two nests were examined on June 11, 1941, both close to the slough at Springhouse referred to in connection with cinnamon teal. One was in short grass on an exposed slope 80 ft. from the water. The second, made of fine grass mixed with down and containing eight eggs, was in a dry situation in a patch of spike rush about 200 ft. from the slough edge (Fig. 21). The female fouled the eggs as she flew off and joined the male on the water.

A nest at 149 Mile Lake had been built 60 ft. from water beside a short post lying on the ground in a grassy swale that had been heavily pastured. The nest contained five eggs on June 12 and nine eggs on June 22; on the first date the dry grass nest contained no down but by June 22 a large quantity had been added. The female was flushed both times the nest was visited and on the second occasion she soiled the eggs as she left.

Another nest found there on June 22 was of the same type and built in a grass clump 50 ft. from the lake shore and one foot from a beaten horse trail. The eggs in this nest and those in the nests at Springhouse were eaten by crows; in two this had taken place before the nests were found. All were more exposed than were the nests of other ducks in the same area.

The population on 149 Mile Lake, as counted on June 12, 1942, consisted of three mated pairs and nine solitary males on territories at different parts of the lake. By June 22 all but two of the males, one of which accompanied a female, had left.

The earliest record for downy young is June 9, 1941; the average number of young in 23 broods was 6.8.

When half-grown or less the broods are inclined to flock together. Thus at 149 Mile Lake on July 12, 1938, a band of 31, all about half-grown, swam from the edge of a round-stem bulrush marsh out to the open lake. Accompanying them were two adult females that, when disturbed by the launching of a canoe, showed their concern by flying toward it and dropping to the water a few yards away. On July 30 this band, now numbering 30, was led by three females.

On July 23, 1943, a female with brood of seven young, three-quarters grown, was idling on a small slough close to its encircling rushes. When they detected my presence all remained perfectly motionless for a few moments, then, as I started walking toward them, the young disappeared into the rushes. When I reached a point about 30 yd. from the female she flapped across the water for several yards in the direction taken by the brood, then rose and left the slough.

Five males examined at close range on Mirage Lake, Aug. 1, 1938, were seen to be in full eclipse.

Redhead. *Nyroca americana* (Eyton).—A spring migration of redhead has not been observed but in early May it is usual to see small bands of mating birds on certain sloughs. Thus at 101 Mile Slough, May 1, 1943, 12 males and five females were so engaged and the familiar catlike cry could be heard some distance away. At Westwick Lake, May 20, 1942, a total of 40 was associated in pairs and in small groups of three or four males and one or two females. These were seen both on the water and in swift courtship flight across the marsh and up and down the lake.

In the Cariboo, as elsewhere in British Columbia, there seems to be a sexual unbalance in which the number of males greatly exceeds the number of females. Westwick Lake is a gathering place for redhead just prior to the moult. On June 17, 1941, a flock of 18 was composed entirely of males and as the summer progressed other males joined this population that usually was visible on open water. On July 18 a total of 60 males congregated in one flock, which included as many baldpate and a smaller number of canvas-back.

EXPLANATION OF PLATE V

FIG. 21. *Nest and eggs of shoveller at Springhouse Prairie.* FIG. 22. *Nest and eggs of American coot at Westwick Lake.* FIG. 23. *Nest and eggs of canvas-back at Williams Lake.* FIG. 24. *Ruddy duck's eggs eaten in nest by crows.* FIG. 25. *Female yellow-headed blackbird on nesting territory.* FIG. 26. *Young marsh hawk at 103 Mile Lake.*


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During the period of the summer moult adult males seldom are seen but an opportunity to examine one at close range under particularly favourable circumstances occurred on Aug. 9, 1943, and again on the following day. This bird swam across a small open pond and climbed on to a boulder close to the shore where, for about 20 min., he dressed his plumage and in doing so brought all parts of the body into view. The bird appeared to be flightless and it was observed with interest that a few of the primary wing feathers had not been shed. These were faded to cream colour, as were the scapulars. Feather deterioration had produced an ochre cast to the head; the back and part of the chest were medium brown but whether this was due to fading or to replacement could not be determined.

A nest at Westwick Lake, containing eight eggs on July 9, 1938, was made of dry round-stem bulrush arranged in a thick clump of green bulrush, the top surface of the nest eight inches above the water. Surrounding it on all sides were nests of eared grebe that the young quite recently had left; the outer edge of one nest was six inches from the rim of the redhead's nest.

The earliest date for downy young is June 5, 1941; the average number of young in 28 broods was 6.9.

Ring-necked Duck. *Nyroca collaris* (Donovan).—One of the less common ducks, present in small numbers on migration and nesting at relatively few places. On Apr. 30, 1943, a total of 14 in pairs associated with diving ducks and baldpate on a small lake near Clinton and in the same general locality on May 10, 1939, a total of 40 was counted.

Females with broods have been recorded from various sloughs in different years and a population of four to six pairs nest each year on 130 Mile Lake. An adult, flightless male in eclipse was examined at a distance of 40 ft. and less on Sorensen Lake, July 9, 1939.

No nests have been found. The earliest date for downy young is July 5, 1938; the average number of young in 21 broods was 6.

Canvas-back. *Nyroca valisineria* (Wilson).—A migration of canvas-back through the Cariboo Parklands is observed in early April, sometimes before the ice goes out of the lakes. A flock of 70, of which approximately 50 were males, counted on 103 Mile Lake, Apr. 16, 1941, probably represented one of the last migrating units to pass through that year. Those that remain constitute an important element in the nesting population of ducks and are distributed amongst the lakes containing round-stem bulrush marshes.

A nest at Westwick Lake, concealed in heavy cover provided by the previous year's growth of round-stem bulrush, was made entirely of bulrush material to which a little down had been added. It measured 22 in. in diameter; the top was eight inches above the water and from it a short ramp led to a small open pool. On May 23, 1942, this nest contained 11 eggs of canvas-back and two of redhead. Another nest of similar construction at Williams Lake contained eight eggs on May 30, 1942 (Fig. 23). These were typical of many others found.

The earliest date for downy young is May 30, 1941; the average number of young in 152 broods was 6.2.

By early July many young are full-grown. Thus at Tatton Lake, July 5, 1938, the members of five broods were nearly as large as the adult females that led them. At this stage of growth and earlier it is common to see broods unattended by adult females and on some lakes a number of broods may come together to form a single band (7). It is of regular occurrence also for young to become detached from a brood and to remain solitary thereafter.

Greater Scaup Duck. *Nyroca marila* (Linnaeus).—It seems likely that migrations of greater scaup duck pass through the Cariboo Parklands in early April and late October but as I have not visited the region at these times none has been observed. The only definite record is that of an adult male on one of the Springhouse Prairie ponds, May 6, 1942. This bird accompanied a male and two female redhead and was identified by careful examination at close range through 6 × binoculars.

Lesser Scaup Duck. *Nyroca affinis* (Eyton).—This is one of the most abundant nesting ducks, conspicuous on many of the more open lakes from April to October.

On July 13, 1943, a female was flushed from a nest with nine eggs built on a small island in 105 Mile Lake where earlier in the season a Canada goose had nested. The scaup's nest contained a large amount of down and was well hidden by a thick growth of silver-weed, *Potentilla Anserina*. Another, at Cummings Lake, built amongst low round-stem bulrush three feet from the water's edge, contained nine eggs on July 22, 1943.

Early in the nesting season, which commences in June, eggs often are dropped in the nests of other ducks, on mud bars, or on resting places in marshes. Thus at 149 Mile Lake, June 3, 1942, one egg was found in an otherwise empty coot's nest, another in a ruddy duck's nest that also contained one egg of the ruddy duck.

The earliest date for downy young is July 4, 1938; the average number of young in 118 broods was 8.3.

In summer a population of postbreeding males and non-breeding, yearling males and females raft on certain lakes; this habit and other observations of general life history are described elsewhere (15).

American Golden-eye. *Glaucionetta clangula* (Linnaeus).—Reported to be a regular transient in early spring and late autumn; only the latter part of the spring migration has been observed in several years.

On May 13, 1942, a total of 26, some in pairs and displaying, was counted on Watson Lake and the following day six were seen on two lakes at 108 Mile. An adult male on a slough at Springhouse Prairie, May 18, was the last recorded that spring. In 1943 a few were observed during the last three days of April and an adult male appeared on Lac La Hache on May 7.

A moulting male was collected on 105 Mile Lake, June 28, 1941. Corixids represented 85% of the food in the stomach of this bird, which in addition had eaten amphipods, dragonfly nymphs, and a terrestrial beetle.

An adult female collected at Disputed Lake, Sept. 23, 1940, had freshly-moulted remiges and retrices; the plumage on dorsal surface was largely new, that on the head and the ventral surface had not been renewed.

This bird had eaten approximately 500 bryozoan statoblasts, which represented 80% of the total food in the stomach, the remainder being amphipods, corixids, and a dragonfly nymph.

Barrow Golden-eye. *Glaucionetta islandica* (Gmelin).—This is perhaps the most common, certainly the most widely distributed, of the nesting ducks and in spring even some farmyard ponds are occupied by mated pairs. All types of lakes are frequented by females and broods; certain of them, rich in animal food, attract a non-breeding population of yearling females. Males disappear from the lakes shortly after incubation commences, as has been stated in an earlier paper (12).

Boitano Lake, a 'soda lake', containing a population of phyllopods, is a feeding place for postbreeding males prior to their departure. On June 11, 1942, four were seen there in company with 22 yearling females. The former had commenced to moult the body plumage and in two the white crescent at base of bill was partly obscured by the incoming brown feathers.

What appears to be a yearling male moulting to eclipse was collected at 103 Mile Lake, June 27, 1942. In this specimen the head is dark brown with a purple sheen, the white crescent incomplete and freckled with black; new brownish, ash-tipped feathers dominate the flanks, and black, brown-tipped feathers the back; all the old plumage, including rectrices and remiges, is faded and worn.

A nest in a somewhat unusual situation was discovered at Tatton Lake on May 3, 1944. At the edge of an aspen wood 150 yd. from the water a 10 ft. stub had become uprooted and in falling lodged against a stout limb of a live tree. The stub, very much decayed, was insecurely held and swayed at a touch. The nest cavity, probably an old flicker's hole, had its entrance two feet from the top of the stub and measured 8 in. in depth. The entrance was ragged and down clung to it conspicuously. The nest contained two eggs.

Mr. Thorval Sorensen, who lives at Westwick Lake, gave me an account of young Barrow golden-eye leaving the nest, which is substantially as follows: For a number of years a dead aspen stood in the farmyard about 40 yd. from his house; between 16 and 20 ft. from the ground was the entrance to a cavity in which a Barrow golden-eye nested each year until the tree fell. He told of seeing 'many times' (which would be once annually for an unrecorded number of years) the young ducks tumble out from the entrance and run to water approximately 50 yd. from where the tree stood. While the young were coming out the female kept flying back and forth between the lake and the tree. She would be seen on the water with one young, then with two and

so on until finally all of the brood was there. Sometimes two birds flew back and forth in this way, undoubtedly the second being a yearling female that had attached herself to the nesting female as yearlings frequently do.

The habit of the female flying from the nesting tree to the water while the young are leaving the nest is perhaps the basis for the story, so often heard, that golden-eye carry their young to the water.

At Horse Lake, in the evening of July 20, 1943, a band of 13 nearly full-grown young on a floating boat-landing was under observation. Standing partly upright they dressed their plumage industriously for about 20 min. then, one by one over a short space of time, all relaxed on their bellies. Ten settled down at the edge of the wharf close together and facing the water; three others were a short distance away on the end of the wharf. Chests were puffed out and heads partly buried amongst the feathers. A boat put out from shore and all the golden-eyes slipped into the water and swam a short distance. Five minutes later they returned, climbed on to the wharf and, after a few minutes spent in preening, relaxed as before. These observations started at 7.00 p.m. At 7.45 an adult female flew down the lake and alighted 30 yd. from the float. She dived twice, then swam to the float and climbed on to the outer end. She remained there for a minute or less, then slid into the water and swam to the shoreward end of the float. She climbed on to it and immediately settled down with her head turned and resting on her back.

The total of young in 43 broods observed from July 9 to July 28 was 257; the average number in a brood was 6.2.

Buffle-head. *Charitonetta albeola* (Linnaeus).—Common summer visitant, spending the first several weeks, April and early May, associated in flocks, composed of both sexes, that are conspicuous by reason of the excited courtship behaviour. After incubation starts the majority of the males leave the nesting grounds and are not seen again until late August or early September (16). In 1942 a male was displaying as late as June 4 and the last appearance of a male was June 17.

The earliest record for downy young is June 9, 1941; the average number of young in 143 broods was 6.4.

Old-squaw. *Clangula hyemalis* (Linnaeus).—In the evening of Apr. 20, 1941, the unmistakable voice of this duck was heard coming from Lac La Hache and on the following morning 12 or more, in company with female surf scoters and golden-eyes, were identified. They remained on the same waters for at least three days and at the times observed were strung out in a line. At no time were they seen to move from the feeding ground, which was a comparatively shallow stretch of water over a bar that extends, with deep water on either side, from the tip of a peninsula at 121 Mile. In 1942, between May 12 and May 15, an undetermined number was heard, more frequently during the night, at the same place. These were with a large flock of surf scoters.

Harlequin Duck. *Histrionicus histrionicus* (Linnaeus).—There are no streams in the Cariboo Parklands suited to the nesting requirements of this duck. Jobin reported seeing a flock of 20, chiefly males, on Williams Lake, Apr. 5, 1944.

White-winged Scoter. *Melanitta deglandi* (Bonaparte).—Common transient and a summer visitant in small numbers. It is one of the latest ducks to appear in spring, the earliest records being Apr. 26, 1941—2 and Apr. 30, 1943—20. In 1939 the first were seen on May 10 near Clinton and at evening on the following day a flock of 35 appeared on Lac La Hache. These were restless, flying high in the air from one part of the lake to another; at one time they passed overhead in the regular alignment this species assumes when on a long flight.

There are numerous summer records of single birds, pairs, and small flocks. The first evidence of nesting was obtained at 103 Mile and 105 Mile lakes in August, 1936 (7); subsequently females with downy young were observed on both these lakes.

On June 2, 1937, two mated pairs and a number of small flocks totalling 28 males and four females were on 103 Mile Lake; all were restless in a strong wind. The population on this lake on Aug. 4 and Aug. 19 comprised two flightless adult males and a female accompanied (on Aug. 4) by a brood of seven young about one-quarter grown. As this bird was approached she swam around the young, making a complete circle, and several times uttered a deep, resonant note. Immediately afterward she rose in the air, circled about the lake several times then alighted about a hundred yards from the brood, which in the meantime had been swimming slowly in a straight course down the lake. On alighting the female called several times, giving a long tremulous call of quite different composition and tempo from the one first heard. This female was unable to fly on Aug. 25; when approached it flapped over the water for a few yards then dived. The six young also dived and the brood was soon widely scattered. In 1938 two pairs and three males were seen on July 3, and on July 19 six males were present. In 1940 one brood was raised on this lake.

The population of 105 Mile Lake, Aug. 6, 1937, comprised one female with seven downy young and two females without broods. On Aug. 16 a second brood of six downies was on the water and the brood of seven again was observed. Twelve individuals were present on July 11, 1938, several of the females, probably non-breeding birds, being in worn, faded plumage. On July 26 a female leading seven downy young was observed and the number in the brood was still seven on Aug. 6. On the same date an adult male and three females were flightless and associated with lesser scaup ducks in the same condition. On Aug. 22, 1939, a brood of five about one-third grown and another of 13 about one-quarter grown followed their respective mothers in single file. On July 5, 1941, four males and two females were recorded. In 1942 a flock of 30 was present on June 4 and this was reduced to 24 by June 17.

On July 18, 12 males and six females were feeding with a flock of lesser scaup duck. The scoters were very wild and some that dived when I paddled a canoe toward them could not be located again; these probably were flightless. On July 24 eight or more were again in company with lesser scaup ducks. All were moulting; it could be seen that two males were in the process of renewing primaries and secondaries but these had not developed sufficiently to permit flight. When approached these two males shuffled over the water, beating the surface with their short wings, then dived. One came up close to my canoe but was not seen again following a second dive.

At Green Lake on July 27, 1937, a flock estimated at 350 was assembled on the centre of the lake and as I paddled toward them they rose at a distance of 150 yd. Possibly these were on migration from the main nesting ground, east of the Rocky Mountains. Near shore a single flightless male dived in front of my canoe and although the surface of the lake was still its reappearance could not be detected.

On Oct. 4, 1940, five of the seven white-winged scoters on 103 Mile Lake were collected. One was an adult male freshly moulted, three were young males and one was a young female. The young birds may have been part of a brood that was raised on this lake. In the stomach of one, about one-fifth filled, amphipods represented 80% of the contents, other food items being corixids, seeds of hornwort, sago pondweed, and water smartweed. In the other stomachs, which were nearly empty, traces of amphipods were present in two and traces of corixids in one; all contained small quantities of algae that included *Zygnema*, *Spirogyra*, and *Colothrix*.

Little information is available concerning an autumn migration; small numbers appear in September and October but nothing approaching a major flight has been observed.

Surf Scoter. *Melanitta perspicillata* (Linnaeus).—Common transient in spring, flocks remaining on some of the larger lakes for a week or longer. The earliest spring record is May 2, 1944, when a flock of 200 ± was counted on the east end of Lac La Hache. In 1942 surf scoters were first seen on May 11. In the evening a flock containing 137 was strung out in a long line on the shallow water over the bar at Lac La Hache referred to earlier. In the days following, counts were made as follows: May 12, 135; May 14, 400; May 15, 1100; May 16, 600; May 17, 100; May 18, 65. Early in the morning of May 15 two bands, each consisting of six males and one female, swam rapidly along shore 50 yd. or so from the beach. Apart from this instance all remained in the waters over the bar and in the adjacent area. Usually they were assembled in two or three flocks.

On the night of May 15 the voices of many kinds of waterfowl carried across the water—the twanging of Bonaparte gulls, the strident calls of Holboell grebe, the whistled note of western grebe, the purring of surf scoters and, rising clearly above this medley, the richly-resonant voices of old-squaw ducks. There was much restless moving about from place to place on the

part of the surf scoters—a sudden increased volume of sound indicating that a flock had taken wing. Perhaps half the number moved out during the night and in the morning the remainder were together in one flock.

Six males and one female, constituting one of the bands referred to above, were courting. The female was in the centre of the group and as they swam rapidly along she frequently threw her head backward so that the bill was pointed upward. The males on either side of her made precisely the same movement; occasionally the female dived and all the males immediately followed. Courtship also took place amongst the scoters gathered far out on the lake but at that distance neither the sex ratio of the active groups nor all the details of behaviour could be determined. However, one action performed time and again could plainly be seen; this was a rush across the water by one male in pursuit of another. Every few minutes all the members of a group would rise and fly 20 or 30 yd. close to the surface with loud whistling of the wings then splash in again and renew courtship on the water.

On May 14 a flock of 40 was counted on Soda Lake. On May 15 on Williams Lake all the members of a flock of approximately 150 were asleep on the water at 11.00 a.m. as if they had quite recently arrived. A flock of six males on Rush Lake, May 22, completed the record of this species for 1942.

In 1943 surf scoters on migration were recorded as follows: Lac La Hache, 122 Mile, Apr. 30—30 (these had left by the following morning); May 3—40±; May 4—20±; May 6—5; May 8—50±; the latter remained on the lake all day; 150 Mile Lake, May 3—1 male; Williams Lake, May 3—20; these latter were asleep on the water at 10.30 a.m. At Horse Lake, May 12, a total of 28 in four flocks was resting close to shore during a snowstorm at 8.00 a.m.

At Boitano Lake on July 10, 1941, a young female, that had difficulty in flying, was examined through 6× binoculars at a distance of about 50 ft. This bird had not been seen on the lake in June.

Ruddy Duck. *Erismatura jamaicensis* (Gmelin).—Summer visitant to the marshy lakes of the region, where the decorative males are conspicuous throughout the summer, long after males of other ducks have gone into eclipse. In the height of the nesting season it is common to see males displaying on open waters or loafing in the narrow channels that cut through the marshes. When disturbed from such places they swim to the marsh edge, where, after a sudden dive and quick emergence, they burst from the water and bump along its surface to the centre of the lake.

A nest at 149 Mile Lake, containing 13 eggs on June 12, 1942, was typical in situation and construction. The material was dry round-stem bulrush, with two green stems added, forming a slightly concave structure 14 in. wide in a clump of rushes near shore, where the depth of water measured 4 ft. The nest contained a few pieces of down. From its rim a short ramp of green rushes led to a floating runway of the same material with the stems laid side by side.

It has been observed on various marshes that ruddy ducks frequently drop eggs on muskrat houses, on shore, or in the marsh and it has been noted also that nests with eggs are deserted for no apparent reason. So also they show a minimum of concern for the young and it is perhaps more common to see young broods unattended than otherwise.

The earliest record for downy young is June 9, 1941; the average number of young in 143 broods was 6.4.

Hooded Merganser. *Lophodytes cucullatus* (Linnaeus).—Scarce summer visitant. On June 6, 1937, a flock composed of two adult males, one young male and two adult females was observed on a slough east of 70 Mile. That year one pair nested near this slough and on July 27 a female with five three-quarter-grown young was found there. There are three other records for 1937, namely, a female on Horse Lake, July 22, one half-grown young at the same place, Aug. 19, and a female on Lily Pad Lake, Aug. 17. On May 3, 1944, a female in company with a pair of buffle-heads was seen on a small pond at 103 Mile. At Buffalo Lake one was banded on Sept. 9, 1933, and on Oct. 5, 1933, Tait identified another in a hunter's bag.

American Merganser. *Mergus americanus* Cassin.—The American merganser population appears to vary little from summer to summer. It is usual each year to see pairs in spring, and later females with broods, on the same stretches of river or lake in many localities.

Horse Lake usually has three or four broods on its waters and generally they permit close inspection. Thus on July 26, 1936, I paddled within 50 yd. of a female and two large young without causing them to race over the water as mergansers commonly do when alarmed. Much larger broods are the rule and casualties amongst them generally small. For example, one that contained eight on July 22 was reduced by only one on Aug. 22. On Aug. 2 a female and brood of eight standing on a floating wharf allowed me to approach within 40 ft. before they slipped into the water. On the same day a band of 22 young of two different ages was led by only one adult female; on the following day two adult females accompanied it. At Bridge Creek, just below the outlet at Horse Lake, on July 17 a female and six half-grown young were disturbed from a log on the creek bank and spattered downstream for several hundred yards. The young then scrambled onto a mudbank and from there ran into an adjacent sedge marsh. Meanwhile the female swam downstream for another half mile, then rose and flew back where later she was seen with four of her young. Hiding under shore shrubbery that bends over the water is a common practice. Thus on July 18, 1943, a female with eight young about one-fifth grown swam close to the edge of flooded alders that lined the lake shore and at times was out of sight behind an intervening screen of branches.

Red-breasted Merganser. *Mergus serrator* Linnaeus.—At 108 Mile Lake on Apr. 29, 1943, I watched an adult male and two females fishing along the shore. This is my only record for the region.

Turkey Vulture. *Cathartes aura* (Linnaeus).—In reference to this species Rhoads makes a general statement to the effect that it occurs over the whole of British Columbia as far north as Lac La Hache (23). Presumably he saw turkey vultures at that place, although he does not say so. There is no evidence of its occurrence there in recent times. The observation of two by Jobin at Horsefly, some 50 miles to the northeast (not within the area covered by this paper), on Aug. 15, 1938, is the only definite record for central British Columbia.

Goshawk. *Astur atricapillus* (Wilson).—Scarce summer visitant; reported to be common in some winters and seen regularly on migration. There are no definite nesting records.

At Lac La Hache, Apr. 30, 1943, a male of the previous year that flew high up along the forest edge above an open hillside was probably on migration. At Fawn Lake, Sept. 26, 1940, an adult female struck at and missed one of several lesser scaup ducks that were flying swiftly over a patch of marsh after being shot at. Other sight records are: Lac La Hache, Aug. 11, 1932, Sept. 17, 1933; Buffalo Lake, Sept. 10, Oct. 18, 1933. No specimens have been examined.

Sharp-shinned Hawk. *Accipiter velox* (Wilson).—Observed on migration (usually cruising along the forest edge at tree-top height) at the following places, viz.; 122 Mile, Lac La Hache, May 1, 1944, May 9, 1943; Horse Lake, May 13, 1943; Watson Lake, Aug. 12, 1940. Sometimes seen in summer, as at 108 Mile Lake, July 24, 1943; a pair raised young near Lac La Hache in the summer of 1938 (13).

Cooper Hawk. *Accipiter cooperi* (Bonaparte).—Single individuals observed as follows: Lac La Hache, Apr. 18, 1941, Aug. 15, 1940; Westwick Lake, May 20, 1942; 119 Mile, June 18, 1940; Horse Lake, Aug. 19, 1937. A specimen in immature plumage was taken at Buffalo Lake, Aug. 15, 1932, and others were seen there during September and October. Rhoads mentions it as nesting at Lac La Hache but gives no particulars (23).

Red-tailed Hawk. *Buteo borealis* (Gmelin).—The red-tailed hawk has not been persecuted by hunters to the same extent here as it has been in more settled districts to the south and is still a fairly common summer visitant, nesting at many places in the lodgepole pine and aspen habitat.

In 1941 the first was seen on Apr. 16 at Tatton Lake, soaring over the tree tops, and at a considerable height it performed what was thought to be a courtship flight. Turning suddenly, it dived almost straight toward the earth for 50 ft. or more, then as quickly turned and climbed upward. This it did four times. On the following day a pair was seen at 102 Mile and a single bird at 103 Mile. By July 5 several broods of young had reached the flying stage. In 1943, from May to July, pairs or single adults were recorded at Horse Lake, 108 Mile, 117 Mile, 119 Mile, Elliott Lake, Jones Lake, and Sheridan Lake. The latest record is Sept. 10, 1942. No specimens have been examined.

Swainson Hawk. *Buteo swainsoni* Bonaparte.—At Lac La Hache, May 2, 1943, a light-coloured male was flushed from the top of a bank above the lake, where it had been plucking a hybrid flicker on the ground. Carrying the flicker, it flew from there into a dense willow swamp and was not seen again. Other records are: Buffalo Lake, Aug. 18, 1932—2; Horse Lake, Sept. 18, 1933—1.

Rough-legged Hawk. *Buteo lagopus* (Brünnich).—Near Lac La Hache, Aug. 4, 1940, an adult female was identified at a distance of 30 yd. and less, first as it stood on a fence post by the roadside, later when it flew to the top of a dead aspen and then to the top of a dead Douglas fir. Undoubtedly this bird was a transient and represents an exceptionally early record for any place in southern British Columbia. An adult in flight was seen at a distance of about 100 ft., 114 Mile, Sept. 8, 1944.

Golden Eagle. *Aquila chrysaëtos* (Linnaeus).—Observed as follows: Horse Lake, Aug. 24, Aug. 26, 1937; 105 Mile Lake, Oct. 2, 1940.

A specimen taken near the junction of the Chilcotin and Fraser Rivers, Mar. 5, 1944, has been examined. This was an adult female containing three well-developed eggs in the ovaries that measured 20, 26, and 32 mm., respectively.

Bald Eagle. *Haliaeetus leucocephalus* (Linnaeus).—Summer visitant nesting beside many of the larger lakes, the same nest being used for many years. There is one near 121 Mile, Lac La Hache, close to the top of a tall, dead Douglas fir that rises 40 ft. or so above the surrounding forest. It is a landmark from the lake but invisible, except at one place, from the nearby Cariboo Road. Mr. Gilbert Forbes informed me that he remembers the nest being there as long ago as 1900, and that it was used each year until 1932. In that year two boy scouts, no doubt concerned about their good deed for the day, climbed the tree at considerable risk and threw down the young. So far as could be learned the nest was not used again until 1942. On May 30 of that year, when the nest was first visited, one adult, believed to be a female, was standing on a dead limb 10 ft. or so above the nest and on subsequent visits it was observed that this was the favourite perch. The head of one young was visible above the nest rim. There were two young in the nest, one larger than the other, and it was not until June 27, when both were well-grown, that the younger bird was seen. By this time the parent had become relatively fearless and would stand on its usual perch while I was in view near the base of the tree. The other parent did not appear nor was it seen at any time. The only food remains found below the nest were the tail and other portions of one sucker. The following year on Apr. 30 the nest again was occupied. As in the previous year only one adult was present at the times it was under observation. On July 27 two young, apparently full-grown, stood on the nest.

An account of two eyries at Horse Lake has been published elsewhere (9). Some of the subsequent history concerning one of these eyries is of sufficient interest to report. On May 30, 1937, both parents were in the vicinity of the

nest, which contained one small young; the female flew several times in a wide circle above the nesting tree, then alighted at the top of another 30 yd. away. Pieces of dry cattail below the nesting-tree suggested that this material had been used in the nest. On July 18 the young bird, now full-grown, stood on a limb above the nest during the 20 min. I spent near the base of the tree and one adult remained in the vicinity during that time, flying from tree to tree and occasionally whistling. The nest was occupied in the years following and was last visited by me in 1943. Mr. Sigurd Larum, a rancher in the neighbourhood who is interested in protecting this eyrie, told me that in June, 1940, one of the eagles flew across the lake toward the tree, carrying a large gull, probably a herring gull, in its talons. When 100 yd. or so from shore it dropped the gull which apparently was not greatly injured, for, after a short time on the water, it flew off.

On June 15, 1941, Mr. Clarence Heller saw two adult bald eagles standing in the shallows of Chimney Creek, near Springhouse, attempting to catch suckers that were ascending the stream to spawn.

Marsh Hawk. *Circus hudsonius* (Linnaeus).—Summer resident. The following are sight records of adults on migration: 122 Mile, Lac La Hache, May 9, 1943; Horse Lake, May 11, 1943; 105 Mile Lake, May 17, 1942, Sept. 18, 1942. The following sight records of adults in summer probably indicate nesting near the localities named: Springhouse, July 3, 1941; 122 Mile, July 13, 1943; 111 Mile, July 15, 1943; 103 Mile, July 21, 1943. Mr. L. Jobin photographed a nest and three eggs at Williams Lake on June 4, 1942. Young birds on migration pass through in some numbers during September.

Hunting marsh hawks were watched many times but on only a few occasions were they seen with prey. On Aug. 2, 1937, one flushed from a fence post carried the body of a half-grown coot for several yards, then dropped it At 105 Mile Lake, Aug. 16, 1937, a young bird was seen to strike at and miss a downy duck on the water. One that flushed from the ground near Lac La Hache on July 13, 1943, carried a mouse in its claws.

The following is typical of many observations. At 105 Mile Lake, Sept. 16, 1939, a young male and a young female hunted along the narrow bulrush marsh that encircles the shore and systematically covered all the area. Numerous times one or another hovered for a moment, then dropped amongst the rushes and quickly reappeared again. So far as could be told nothing was captured at these times. A number of mallard, shoveller, and blue-winged teal were flushed by the hawks and to these they seemed to pay no attention. On another occasion, San Jose River, July 3, 1936, an adult female was seen flying directly above four full-grown pintail that were resting on the water. Although the hawk passed within 20 ft. of the ducks they exhibited no evidence of fear and maintained their relaxed attitudes. At 103 Mile Lake, Aug. 9, 1940, a bird of the year was found floating in the water, uninjured, but not able to rise. It was taken ashore and after an hour or so drying in the sun

flew off. Perhaps the bird had attacked one of the many coots on the water and in the ensuing struggle had become saturated and helpless (Fig. 26).

Osprey. *Pandion haliaëtus* (Linnaeus).—Summer visitant, nesting at Horse Lake, Sheridan Lake, Lac La Hache, Williams Lake, and elsewhere. The earliest recorded date of arrival is Lac La Hache, Apr. 16, 1941, the latest date seen Buffalo Lake, Sept. 24, 1933.

Gyrfalcon. *Falco rusticolus* Linnaeus.—Near Williams Lake, Apr. 1, 1944, Mr. Jobin saw a large falcon strike down a sharp-tailed grouse. By using a set camera and the dead grouse as bait he succeeded in obtaining a good photograph of this falcon when it returned later to its prey. From the photograph the subject has been identified as a gyrfalcon. The identification has been checked by Dr. Alden H. Miller. The form most often occurring in British Columbia is *F.r. uralensis* Sewertzov and Menzbier. This is the only known record for the Cariboo Parklands.

Prairie Falcon. *Falco mexicanus* Schlegel.—At Sorenson Lake, June 10, 1941, a female prairie falcon flew swiftly along the length of the lake, stooping several times at ducks on the water as if in play without deviating from its course. One appeared over this lake the following day and one at Boitano Lake, six miles to the south, on June 12; very likely it was the same bird in each instance. The one seen at Boitano Lake struck and missed a female pintail that was flying from her nest to the lake. After the duck had plunged down to the water the falcon swung out over the lake, then headed for a grove of aspens on the shore that she circled several times. She was indifferent to the attacks of four crows that, cawing excitedly, flew out from different parts of the grove and attempted pursuit; she straightened her course and soon outdistanced them.

Duck Hawk. *Falco peregrinus* Tunstall.—Seen occasionally in late summer and autumn; so far as known none nests in the region. A female taken at 105 Mile Lake, Sept. 18, 1942, apparently a bird of the previous year, is nearly as dark in colour as specimens of *F. p. pealei* from the Pacific Coast. Some of the feathers on the throat have dark shafts, a character noted in both adults and young of that race. The crop of this specimen contained the feet and other parts of a sparrow hawk.

Young duck hawks have twice been seen in pursuit of black terns and on the first occasion, Horse Lake, July 31, 1933, the tern eluded its pursuer. The second time, Longbow Lake, July 27, 1937, a young male flew swiftly across the lake about 75 ft. above the surface and from this height stooped at a tern and knocked it into the water, apparently without causing it serious damage. Just prior to the falcon's sudden appearance the air had been full of bird sounds, dominated by those made by terns and red-winged blackbirds. Several broods of downy ducks swam close to the edge of the marshy shore. Instantly, as the falcon appeared, the bird voices were stilled to a silence that lasted, conspicuously, for several minutes and the young ducks vanished into the marsh cover.

Pigeon Hawk. *Falco columbarius* Linnaeus.—Occasionally seen on migration. At Springhouse on May 18, 1942, a very dark male stooped at a marsh hawk, then passed close to me in swift flight. Another, a light-coloured male in the second year, was seen at Lac La Hache, May 12, 1943, and a female of the year, regarded as *F. c. bendirei*, was taken at Horse Lake, Sept. 23, 1934. The stomach of this specimen contained grasshopper debris exclusively. A mated pair was collected by Rhoads at Lac La Hache in the summer of 1892 (23).

Sparrow Hawk. *Falco sparverius* Linnaeus.—Summer resident, arriving during the latter part of April. In 1941 the first were seen on Apr. 16 at 122 Mile. In 1944 one was seen by Jobin at Williams Lake on Apr. 9. The latest record is Buffalo Lake, Oct. 5, 1932. In some years it is common on the Cariboo Highway during migration in September. Along a 19-mile section of road between 103 Mile and 122 Mile, totals of 24 on Sept. 18, 1942, and 27 on Sept. 19, 1942, were counted; two days later only four were seen on the same territory.

Sparrow hawks have been watched at different times and places teasing red-tailed hawks. For example, at Horse Lake, Aug. 18, 1937, one flew at a young red-tail that was standing in a dead aspen and struck with sufficient force to make the red-tail open its wings and sway on the perch. At 119 Mile on June 18, 1942, one of a pair of red-tails soaring above the tree tops was worried by a sparrow hawk that swooped from above time and again for 10 min. or more. Later a straight-away flight took place, with the red-tail flying fast in an attempt to escape its tormentor. Other birds also are subjected to these attacks that seem to fulfill no purpose other than that of play. At Lac La Hache on Sept. 9, 1942, a migration of flickers was passing through and a group of five that alighted on top of a tall Douglas fir were harried by a sparrow hawk. It dashed at one or another of them as they took flight, then settled on the perch one of them had vacated. Near the same place, Sept. 13, 1942, one repeatedly flew at a male pileated woodpecker that clung to the extreme tip of a fir tree, from which it refused to be dislodged.

Sparrow hawks hunt grasshoppers and voles along the road and not infrequently one is killed by a passing car. The stomach of one found dead on the road Aug. 16, 1941, contained fragments of an adult ground beetle. On Aug. 7, 1937, one was seen tearing at the remains of a sora that had been killed, probably by striking a telephone wire.

Interior Blue Grouse. *Dendragapus obscurus* (Say).—Restricted to the mountain slopes along the southern boundaries of the parklands, north over a forested ridge to approximately the latitude of 60 Mile on the Cariboo Road and to the region adjacent to the Fraser River Valley. A large territory of parkland forest, including the Lac La Hache Valley and east nearly to the Cariboo Mountains, is unoccupied by the species. According to the statements of ranchers long familiar with the region, blue grouse have not been seen in this area at any time. There are, however, a few summer records for

localities within the boundaries of the unoccupied territory as outlined above: one was seen three miles east of Williams Lake village, July 7, 1941, and Tait observed a brood about four miles east of Buffalo Lake on Aug. 17, 1932. These localities may represent the extreme points of penetration into the east and west portions of the unoccupied territory.

A nest with eight eggs at Whiskey Creek, 13 miles north of Williams Lake, was photographed by Jobin on May 10, 1943.

A female collected at Clinton and three males and two females collected at Hanceville, which is west of the Fraser River, all young of the year taken in late September, are pale-coloured and indistinguishable amongst a large series of specimens from the Okanagan Valley. They are identified as *D. o. richardsoni* (Douglas).

Franklin Grouse. *Canachites franklini* (Douglas).—Observed occasionally in certain localities each year. It seems evident there has been a progressive decline in numbers since 1932, when it was relatively common.

Males sometimes accompany a female and her brood. Thus at Horse Lake, July 18, 1937, when a female with several young was discovered in the lower branches of a spruce, it was observed that an adult male was on the ground below and as I walked toward them he commenced to display. With wings drooped, tail spread and at right angles, contour feathers fluffed out, and scarlet combs almost meeting, he glided through the short grass for 50 ft. or so, in his course walking over a log and around a bush, then finally disappeared into thick cover.

Ruffed Grouse. *Bonasa umbellus* (Linnaeus).—Distributed throughout the region. It was extremely plentiful in 1932 and this proved to be a peak year. In 1933 it was scarce and in no year since then could it be called abundant. During the period 1937 to 1943 the species seems to have become fairly stabilized at a comparatively low population level. Possibly this does not apply to remote regions not visited by many hunters.

At Horse Lake on May 13, 1943, a male was flushed from a drumming-log—a dead aspen 10 in. in diameter in open aspen woods. Alongside the log, droppings had accumulated in a mound that contained an estimated three pints of material. The older faeces at the bottom of the pile were dry and discoloured, suggesting this had been used as a resting place for several months.

Willow Ptarmigan. *Lagopus lagopus* (Linnaeus).—It is reported by Jobin that willow ptarmigan winter at Big Creek, 70 miles southwest of Williams Lake, where photographs were obtained in the winter of 1943-44. He reports also the occurrence of a single individual on the outskirts of Williams Lake village in the winter of 1939-40.

White-tailed Ptarmigan. *Lagopus leucurus* (Richardson).—A photograph of this species was obtained by Jobin in the winter of 1943-44 at Big Creek, where a few were found in company with willow ptarmigan.

Sharp-tailed Grouse. *Pedioecetes phasianellus* (Linnaeus).—Relatively common in 1932 in the Lac La Hache Valley, in the region about 100 Mile and east beyond Bridge Lake. Since then there has been an increasing reduction in numbers and it is now decidedly scarce. A photograph of newly-hatched young in the nest was taken by Jobin at a place 14 miles north of Williams Lake on June 3, 1941.

European Partridge. *Perdix perdix* (Linnaeus).—An introduction in the Lac La Hache Valley in 1935, approximately, was not successful.

Ring-necked Pheasant. *Phasianus colchicus* Linnaeus.—Established on Moon's Ranch on the west side of the Fraser River and on the Alkali Lake Ranch, 30 miles south of Williams Lake. An introduction at Williams Lake in 1933, approximately, was not successful.

Lesser Sandhill Crane. *Grus canadensis* (Linnaeus).—Transient, formerly abundant. The late Duncan McKinley, who was born in the Lac La Hache Valley some 80 years ago, asked me once what had become of the cranes. He then pointed to a long side-hill stretch of open range and said that in the old days it used to be covered with cranes in the spring when they stopped there to rest. He said also that the spring migration lasted for a week or more and during that time great flocks were continually passing—very likely these were lesser sandhill cranes. This was the Duncan McKinley to whom Rhoads frequently refers (23).

It is different now. Mr. L. Jobin saw a flock of 100± at Riske Creek in the Chilcotin, May 27, 1942, and flights are reported over Francois Lake, far to the northwest, but no recent migrations through the Lac La Hache Valley have been reported and I have seen none there.

Sandhill Crane. *Grus mexicanus* Müller.—Summer visitant, arriving in April (Lac La Hache, Apr. 25, 1944) and nesting in the more remote swamps between Chimney Creek Valley and Lac La Hache, east of that lake and elsewhere on both sides of the Fraser River Valley. Mr. Gilbert Forbes told me that several years ago a pair nested and raised young in a meadow about seven miles north of Lac La Hache and subsequently a pair was seen there in April, 1942. On May 13, 1942, Jobin photographed a nest with two eggs built on a boggy island surrounded by bulrushes in Bobtail Lake. The following year at the same place he obtained pictures of a female on the nest and of her mate. At Springhouse Prairie in late May, 1942, four, sometimes five, were seen a number of times both on the ground and in flight.

Virginia Rail. *Rallus limicola* Vieillot.—Summer visitant, less common than the sora; the earliest recorded date of arrival is Apr. 19, 1941, at 105 Mile Lake. Seen or heard at Williams Lake, July 12, 1938; Anthony Lake, July 30, 1938; 105 Mile Lake, June 17, 1943. At Tatton Lake, June 3, 1942, six fresh eggs of this species were found lying close together on the wet ground in a bulrush marsh; three were intact, one was punctured on the side and two were broken. Search in the vicinity for a nest was not successful. One specimen was taken at Horse Lake, Sept. 22, 1940.

Sora. *Porzana carolina* (Linnaeus).—Common summer visitant, seen, or more often heard, each year on most of the marshes visited. The earliest date of arrival recorded is May 2, 1943, at Lac La Hache. A nest containing 16 eggs was photographed by Jobin near Williams Lake on June 5, 1939.

The stomach of one collected at 119 Mile, Aug. 3, 1938, contained 30 seeds of *Scirpus acutus*, representing 80% of the total food, and insect fragments, chiefly of corixids.

American Coot. *Fulica americana* Gmelin.—Abundant summer visitant, arriving in April and associating in flocks for several weeks until all have paired and established territories.

Nests are made exclusively of dry round-stem bulrush and are usually situated in clumps of this plant that early in the season show only old growth above the surface of the water (Fig. 22); later the incoming green stalks add concealing cover. After summer has advanced nests are sometimes built in open stands of green bulrush and to provide more cover some supporting stalks are bent over and worked into the fabric of the nest platform.

During the laying and incubation periods courtship display and male rivalry on the territories are exhibited intermittently, and they persist with less vigour late into the summer. In 1943 examples of this were noted as late as July 27. The nesting season is long, and small young are seen from late May until late in August. Ten or more eggs are laid but casualties amongst the young are high, so that broods in excess of four or five are the exception.

Killdeer. *Oxyechus vociferus* (Linnaeus).—Common summer visitant; Mar. 9, 1944, is the earliest date observed at Lac La Hache. A nest amongst short grass on an open meadow at Springhouse contained four eggs on May 23, 1941. Another, near 149 Mile, with four eggs on June 9, 1941, was on a gravelled turn-out on the Cariboo Highway. This was discovered when a killdeer flew out from below the rear end of a car that had straddled the nest.

Golden Plover. *Pluvialis dominica* (Müller).—A specimen taken at 103 Mile Lake, Oct. 4, 1940, is the only record. This is a bird of the year and typical of the race *P. d. dominica*.

Black-bellied Plover. *Squatarola squatarola* (Linnaeus).—Autumn transient; sight records at 103 Mile Lake, Sept. 15, 1939—3; Sept. 17, Sept. 19, 1942—4. One specimen taken at Soda Lake, 108 Mile, Oct. 1, 1940. This bird had eaten corixids, other unidentified insects, and one seed of hornwort.

Wilson Snipe. *Capella delicata* (Ord).—Summer visitant. Small flocks have been observed in August. For example, 130 Mile Lake, Aug. 3, 1936—6; Lily Pad Lake, Aug. 7, 1937—10.

At Horse Lake on May 26, 1937, and during the week following, Wilson snipe frequently were flushed in a wet meadow and heard 'bleating' whenever the area was visited. On May 27 a nest containing four eggs, concealed in a clump of sedge at the base of a small willow, was discovered through seeing

a snipe run out of the sedge clump. The bird ran about 20 ft. and then lay prostrate with wings drooped and spread-tail elevated. After a moment, with wings and tail in this position, it dragged itself over the ground making a continuous, squealing cry. Later, in July, it was observed that the eggs had hatched successfully and fully fledged young frequently were flushed from this meadow; by Aug. 21 the local population had left.

Long-billed Curlew. *Numenius americanus* Bechstein.—Summer visitant; nests at Dog Creek and at various localities west of the Fraser River in the Chilcotin district. Nest, eggs, and parent were photographed by Jobin at Riske Creek on May 14, 1940. Another nest with four eggs, at Baldy Mountain, 40 miles west of Williams Lake, was photographed on May 14, 1940.

Rhoads reported it nesting, and collected one specimen, at Lac La Hache in 1892. None has been seen there in recent years.

Upland Plover. *Bartramia longicauda* (Bechstein).—Reported from 158 Mile, where one specimen was taken in 1901 (1).

Spotted Sandpiper. *Actitis macularia* (Linnaeus).—Summer visitant; an unusually early date of arrival is Apr. 30, 1943, at Lac La Hache. The majority arrive several weeks later; at Springhouse Prairie in 1942 the first arrival was recorded on May 20 and the first nest with four eggs was found on June 10. The earliest nesting date, a nest with one egg, is June 1, 1941; the latest is a nest at Lac La Hache that contained two eggs on July 11, 1942, and four eggs on July 15. Approximately five broods of large young were on the beaches of 108 Mile Lake, July 21, 1942.

Solitary Sandpiper. *Tringa solitaria* Wilson.—One spring record, viz.; 120 Mile, May 14, 1942. Regular transient in late summer; there are numerous sight records in different years between July 20 and Aug. 1 (Horse Lake, Aug. 1, 1933—12). An adult female collected June 26, 1942, at 121 Mile is the earliest record. This and an adult male taken at 103 Mile Lake, July 21, 1943, are examples of the race *T. s. solitaria* Wilson. The latter had eaten five cranefly larvae, Tipulidae (the chief item of food in the stomach), four aquatic beetle larvae, 10 chironomid larvae, and two damselfly nymphs (*Enallagma* sp.).

Greater Yellow-legs. *Totanus melanoleucus* (Gmelin).—Common summer visitant; the earliest date of arrival is Apr. 28, 1938, at Clinton. A flock of seven feeding in a flooded meadow at Horse Lake, May 10, 1943, probably represented the last of the migration that year.

Mr. L. Jobin photographed a nest and four eggs at Jones Lake on June 18, 1943, and another with three eggs at Lily Pad Lake on June 20, 1943. These records represent unusually late nesting dates.

In the latter part of May each of many grassy meadows, usually bordering a slough and adjacent to dry aspen-covered ridges, is occupied by a pair.

Display flights were seen at "Dam" Lake, May 11, 1939, and at Tad Lake, May 13, 1939. In both instances the bird, with wings moving very fast, followed a straight course for a short distance, then on set wings rose a few feet and after travelling for several yards on this higher level descended to the former plane and resumed the rapid wing beats. This pattern of flight on two planes continued until the bird had travelled more than 100 yd. The flight was accompanied by the quick repetition of a call on one note, repeated so rapidly that the syllables slurred thus—*goya, goya, goya.*

In early summer, when parent and young are on their territory, the parent is extremely active and noisy in defence. One at 93 Mile, June 27, 1933, flew swiftly toward me at a low level, circled overhead a few times, alighted on top of a small lodgepole pine, then flew to the top of another. All these movements were accompanied by the familiar staccato whistle, constantly repeated at a tempo faster than ordinary. Young were hiding in the meadow and finally one of these, about one-quarter grown, was seen amongst the sedges.

These noisy demonstrations, in a modified form, may continue until after the young are full-grown. Thus on July 19, 1943, when two flying young whistled (as they rose from a flooded meadow and then settled again), an adult came in swift flight, circled over my head and whistled twice, then alighted beside the young.

At 103 Mile Lake, July 13, 1943, four adults and 12 young fed together along the muddy beach, making no sound other than the familiar whistle when flushed. This behaviour was in marked contrast to that exhibited by an adult that came from a place inshore and repeatedly circled overhead, calling vigorously.

A southern migration takes place in July and toward the end of the month the flocks are composed chiefly or exclusively of young. The last record for an adult is July 22, 1943, at Cumming's Lake. A flock of 33 young at 103 Mile Lake, July 21, 1943, was the largest number seen together. The latest date on which the species was recorded is Oct. 2, 1932, at Buffalo Lake.

Lesser Yellow-legs. *Totanus flavipes* (Gmelin).—Common during southern migration. There is one sight record for adults, viz.; 103 Mile Lake, July 13, 1934—3; these were with greater yellow-legs. All seen later in the summer have been young, the earliest record being 150 Mile Lake, July 17, 1939—4. Other records are: 103 Mile Lake, July 21, 1943—1; 143 Mile Slough, July 31, 1937—4; 103 Mile Lake, July 26, 1938—7; Mirage Lake, Aug. 1, 1938—15, Aug. 11—20.

In one specimen mollusc fragments constituted 70% and in another corixids represented 95% of the food in the stomach. These birds had also eaten chironomid larvae and damselfly nymphs. Both specimens were taken at 119 Mile, Aug. 7, 1938.

Pectoral Sandpiper. *Pisobia melanotos* (Vieillot).—There is one sight record for spring, viz.; Elliott Lake, May 13, 1942—1. Two young of the

year were collected at 103 Mile Lake, Sept. 18, 1943. These and four others were in company with long-billed dowitchers. At Buffalo Lake in 1932 it was seen regularly between Sept. 9 and Sept. 22 and in 1933 between Sept. 19 and Sept. 24. One specimen was taken there.

Baird Sandpiper. *Pisobia bairdi* (Coues).—At Watson Lake, May 13, 1942, two Baird sandpipers were examined at close range through 6× binoculars. At Mirage Lake in 1938 five were seen on Aug. 1 and on Aug. 11. On the latter date a specimen was collected; another was taken at Buffalo Lake, Sept. 13, 1933.

The Mirage Lake bird had eaten 12 phyllopods, *Branchinecta* sp., which represented 80% of the food in the stomach; other items present were several corixids, two chironomid larvae, and three aquatic beetle larvae, *Hydroporus* sp.

Least Sandpiper. *Pisobia minutilla* (Vieillot).—Spring and autumn transient. There are three sight records for spring, viz.; Lac La Hache, May 14, 1942—2; Horse Lake, May 10, May 11, 1943—2. The earliest date for the first autumn transients is July 13, 1938, when four were seen at 108 Mile Lake. Other autumn records are: Mirage Lake, Aug. 1, 1938—6; Aug. 11, 1938—5; 103 Mile Lake, Aug. 6, 1940—2; Aug. 14, 1940—16; 150 Mile Lake, Aug. 14, 1938—15.

Dowitcher. *Limnodromus griseus* (Gmelin).—Adults in summer plumage, as well as young, are regular autumn transients, the first adults appearing in July, the young in August and September. The following are details of sight records:

ADULTS

103 Mile Lake, July 2, 1942 —1
Williams Lake, July 12, 1938 —7
"Disputed Lake," July 29, 1936—8
119 Mile Lake, Aug. 3, 1938 —3
103 Mile Lake, Aug. 6, 1940 —5
103 Mile Lake, Aug. 14, 1940 —4
103 Mile Lake, Aug. 25, 1937 —1

YOUNG

119 Mile Lake, Aug. 3, 1938 —2
103 Mile Lake, Aug. 14, 1940 —3
103 Mile Lake, Sept. 18, 1942 —4
Buffalo Lake, Sept. 25, 1933 —1
103 Mile Lake, Oct. 2, 1940 —2

Two adults in worn breeding plumage, collected Aug. 3, 1938, and Aug. 25, 1937, are apparently both males, although one was not sexed. These appear to represent the relatively long-billed, short-winged subspecies, *L. g. scolopaceus*, as does a young bird taken at Buffalo Lake, Sept. 25, 1933. The adult Cariboo specimens have been compared with a series of nine adult *L. g. griseus* (*L. g. hendersoni* Rowan) from the coast of British Columbia and from Alberta.

The stomach of one of the specimens referred to above, Aug. 3, 1938, contained 60± chironomid larvae and a few seeds of *Potamogeton pusillus*.

In the other six large dipterous larvae (98%) and two chironomid larvae represented the total contents.

Semipalmated Sandpiper. *Ereunetes pusillus* (Linnaeus).—Transient in spring and autumn. The following are sight records: Watson Lake, May 14, 1942—4; Mirage Lake, Aug. 1, 1938—1; Horse Lake, Aug. 18, 1937—3, Aug. 21, 1936—3.

Wilson Phalarope. *Steganopus tricolor* Vieillot.—Regular summer visitant. (Fig. 11). Downy young were photographed by Jobin at 149 Mile Lake early in June, 1941. Two pairs at Watson Lake, June 13, 1942, were believed to be nesting and the behaviour of a male at 130 Mile on June 26, 1941, and of a male on June 15, 1942, suggested that young were concealed in the grass. Eight full-grown young, several still with down attached, accompanied greater yellow-legs at 103 Mile Lake, July 21, 1943. Other records are: Horse Lake, May 27, 1937—1; North Bonaparte, June 6, 1937—2; Elliott Lake, July 19, 1938—2; Mirage Lake, Aug. 1, 1938—18 young, Aug. 4, 1938—4 young; 103 Mile Lake, Aug. 6, 1940—1 young.

The stomach of a specimen from Mirage Lake, Aug. 1, 1938, contained corixids as the exclusive food item; two from 103 Mile, July 21, 1943, had eaten damselfly and dragonfly nymphs, chironomid larvae, diptera larvae, corixids, aquatic beetles, *Hygrotus* sp. (larvae), and *Haliplus strigatus* (adults).

Northern Phalarope. *Lobipes lobatus* (Linnaeus).—Regular transient, less common in spring. The following are sight records: Springhouse Prairie, May 22, 1942—3, June 13, 1941—3; North Bonaparte, July 27, 1937—6; Mirage Lake, Aug. 1, 1938—5, Aug. 4—17, Aug. 11—88; Cumming's Lake, Aug. 10, 1938—20, Aug. 10, 1940—6; Watson Lake, Aug. 6, 1940—6 (Fig. 13); Buffalo Lake, Aug. 30, 1933—100±.

Long-tailed Jaeger. *Stercorarius longicaudus* Vieillot.—At Buffalo Lake, Sept. 11, 1933, Tait rowed within approximately 20 ft. of an adult long-tailed jaeger that was swimming on the lake. It then rose and flew past the boat within a few feet, so that all distinguishing marks were clearly visible.

Herring Gull. *Larus argentatus* Brünnich.—Small numbers visit Lac La Hache on migration, the earliest date seen being Apr. 18, 1941—3. The largest number counted there at one time was five on May 15, 1942. Wandering adults and immature birds are not uncommon at Horse Lake, Sheridan Lake, and Williams Lake and probably at some time visit most of the lakes in the district. In a flooded meadow at Horse Lake, May 28, 1937, two were hunting food amongst the growth of fresh green sedges that had attracted also crows and numerous red-winged blackbirds.

In 1941 a pair remained on 130 Mile Lake from Apr. 18 at least until July 7, when the place was last visited. Often the two stood close together on an old muskrat house; they were quite tame and allowed me to paddle within 50 ft. or so before they rose, whereupon they would circle slowly within a short radius for a few minutes, then alight again on the water, never far from the

muskrat house. On this loafing place, used for so long, was an accumulation of feathers, droppings, and regurgitated pellets. The latter consisted of the bones, scales, and pharangeal teeth of squawfish and chub, representing fishes about 8 in. in length.

It was suspected that this pair was nesting, although the surroundings of floating bog and cattail marsh seemed unsuitable, but a thorough search for a nest in these surroundings was not successful.

The only known breeding colony is at Bridge Lake, where 15 to 20 pairs nest each year on a rocky islet. Accounts of this colony as observed in 1933 and 1935 have been recorded (5, 8). Nests with eggs and downy young were photographed there in 1935 (Fig. 14).

A breeding female collected at Bridge Lake, July 26, 1933, is typical of the race *L. a. smithsonianus* Coues.

California Gull. *Larus californicus* Lawrence.—One sight record of a young bird, Horse Lake, Aug. 24, 1943, another of two at Lac La Hache, Sept. 8, 1944. The California gull in the first summer is much darker than the young of any other large gull that passes through the interior; consequently it can be identified, under favourable circumstances, with confidence.

Ring-billed Gull. *Larus delawarensis* Ord.—Transient in spring and late summer. In 1942 the following were recorded: Lac La Hache, May 12—32, May 15—10; 105 Mile Lake, May 12—6; 149 Mile Lake, June 12—1. Autumn records are: Montana Lake, July 26, 1933—2 young; Mirage Lake, Aug. 11, 1938—1 young. The latter was collected; the total of food in its stomach consisted of corixids, 25%, and phyllopods (*Branchinecta* sp.), 75%.

Short-billed Gull. *Larus canus* Linnaeus.—On May 11, 1939, a flock of 48 adult short-billed gulls and 16 Bonaparte gulls was assembled in a long line on 105 Mile Lake. All rose when approached and after gaining altitude commenced to ascend higher in a wide spiral until they appeared as white flecks against the clear sky. In a short time they descended and settled on the water. Some of the short-billed gulls remained there only for a few moments then flew upward for 100 ft. or more. From this height they descended with great speed, which was checked when they were a few feet above the water, and a second upward flight was taken. This upward flight and sudden descent were repeated numerous times. The speed of the downward flight seemed equal to that of the familiar earthward swoop of the nighthawk.

At Mirage Lake, Aug. 11, 1938, three juveniles were collected. Corixids were the chief item in the stomachs of two of these, 95 and 99%, respectively, and represented 25% of the food in a third, the remainder of the animal food present being phyllopods. One stomach contained a seed of hornwort.

Bonaparte Gull. *Larus philadelphia* (Ord.)—Abundant transient and summer visitant in small numbers (Fig. 2). The earliest recorded date of arrival is Apr. 30, 1943, at Lac La Hache. A concentration of surf scoters

and other diving ducks on this lake, referred to earlier, attracted various other waterfowl, amongst them Bonaparte gulls. On May 14, 1942, a flock of 40 alighted close to the scoters, and the following day in the forenoon approximately 100 appeared in the same place. At 5.00 p.m. the same day about 250 frequented the waters at the entrance to a shallow bay about half a mile from the scoter flock. After a time they rose and, travelling in a long straggling flock composed of formations of 20 or 30 abreast, alighted close to the scoters. On May 16, in the early morning, 100 or so were close inshore, apparently picking small objects, possibly chironomids, from the surface of the water. One viewed at close range was an immature bird lacking the black head. All had apparently left by 6.30 p.m. A few heard on May 17 represented the last of the migration.

On Apr. 30, 1943, 200± were on the lake with the ducks and by the next morning all had gone. A few small lots, up to 10 on May 5, were recorded during the next few weeks, then at 3.00 p.m. on May 28, during a rain-storm, a flight of 150± in small detachments, all flying high, passed along the shore. Earlier, at Horse Lake, May 12, 7.30 a.m., a flock of 70± flew northwest high over the lake during a snow-storm and their twanging voices could be heard at times when the birds themselves were hidden by the falling flakes.

An account of the nesting island at Bridge Lake as observed in 1935 has been published (6). Mr. J. Stewart informed me that he has visited the island and found occupied nests in each of several recent summers. On July 1, 1941, he obtained photographs of a bird that was incubating three eggs in a nest built close to the top of a small spruce on the shore of the island. Another photograph of a nest and two eggs was obtained June 13, 1943.

During June and July it is not unusual to see a few vagrant adults but there is no definite migratory movement until August. At Williams Lake, Aug. 11, 1936, a flock of four adults and 23 young in the flying stage rested on the water near the centre of the lake. This is typical of other migrating flocks seen during late summer.

The stomach of a bird of the year collected at Mirage Lake, Aug. 1, 1938, contained 90 ± corixids and one phyllopod.

Sabine Gull. *Xema sabini* (Sabine).—Tait collected an adult in worn summer plumage at Buffalo Lake, Sept. 16, 1933, and saw another adult there, at very close range, Sept. 18, 1933; both were swimming on the lake.

Common Tern. *Sterna hirundo* Linnaeus.—Regular transient. The following are sight records: Williams Lake, May 30, 1942—4; 103 Mile Lake, July 19, 1938—6; Horse Lake, Aug. 22, 1937—5, Aug. 23—3; Buffalo Lake, Sept. 2, 1933—25, Sept. 10, 1933—8, Sept. 16, 1932—1.

Arctic Tern. *Sterna paradisaea* Brünnich.—At Williams Lake, Aug.11, 1936, eight adult terns accompanied a flock of 27 Bonaparte gulls that for a time rested on the water. Later the terns passed alongside and over my canoe at close range and were identified as *paradisaea* on the basis of the all-red bill.

A specimen of this tern was collected at Chezacut, some 80 miles to the west, on July 30, 1931, by Mr. K. Racey.

Black Tern. *Chlidonias nigra* (Linnaeus).—Common summer visitant, nesting on numerous marshy lakes throughout the district. The earliest date of arrival is May 23, 1942, at Westwick Lake. There is some annual fluctuation in the numbers composing individual colonies (see Table) and some nesting marshes are not occupied each year. The largest of three widely separated colonies at Horse Lake numbered 35± pairs on July 31, 1933, 25 pairs on July 23, 1936, and 30 pairs in 1937. On May 26, 1937, no evidence of nest building was detected, but on July 15, a little over 6 wk. later, young from the downy to the flying stage were everywhere in evidence about the sedge marsh where the nests had been built; a few of the younger birds still were on the nests but the majority swam about in the narrow channels through the marsh. The flying young, in the intervals between their first weak flights, rested on grass tussocks or lumps of debris at the water's edge. The adults when not in noisy flight gathered on the top rail of a fence or on the branches of several dead, prostrate spruces that had drifted into the bay. When the marsh was next visited, on Aug. 18, all had left.

In a bulrush–cattail marsh along the San Jose River, where it enters 130 Mile Lake, members of a colony of approximately 25 pairs were incubating eggs on June 26, 1941. Several nests, made of rotted round-stem bulrush, rested upon a floating mass of this material, held in position on three sides by green rushes and on the other by the base of an old muskrat house. In 1942 the first black terns appeared over this marsh on May 30 and by June 13 at least 15 pairs had established territories on their usual nesting ground. On the latter date, as I paddled through the marsh channels, terns rose from numerous places and at a height of 50 ft. or more circled over the nesting area. Once a total of 15 joined in a flock and flew swiftly from one part of the marsh to another. Like a flock of waders they wheeled in perfect unison, now high in the air, now just clearing the rushes or sweeping down to the open water of the lake. Soon the flock fell apart and its members resumed the usual pattern of flight. Approximately 30 pairs occupied the marsh in 1943 and some were feeding young on July 12. No young were flying on this date and no adult showed evidence of moult.

Adults leave the nesting marshes before the young do. For example, at Horse Lake on July 29, 1936, all but one of the adults, which numbered approximately 50 on July 23, had left the marsh. A migration was observed there on Aug. 19, 1937, when black terns were in sight for two hours during a canoe trip of eight miles along the lake shore. It was estimated that 200 passed through during that time, all being young of the year. With or near them were numerous nighthawks and black swifts and both these and the terns appeared to be feeding on mayflies that had emerged in great numbers. An early migration was observed at 108 Mile Lake on July 23-24, 1943. On the first date 10 adults, and on the second 35 adults, were congregated about two rocky islets and a row of partly-submerged boulders that connected

them. Some stood on the boulders, others hawked over the water in the characteristic manner, swooping down to the surface at intervals and obviously obtaining some food there. It was seen that several showed intrusions of white winter plumage on the black cheeks and breast. The date last seen is Sept. 4, 1933, at Buffalo Lake.

The following summarizes the food eaten by two adults and four juveniles.

Each of the two adults, 108 Mile Lake, July 24, 1943, had eaten 34± damselfly nymphs, *Enallagma* sp.; other food items identified were adult diptera, adult chironomids, two ants, one spider. The stomachs of two half-grown young, Tatton Lake, July 21, 1938, contained adult dragonflies, exclusively. The stomachs of two large, downy young, 130 Mile Lake, July 6, 1941, contained vertebrae and pharangeal teeth of minnows, probably *Richardsonius balteatus*, as the chief item (65 and 80%), other food items being an adult damselfly and a forest tent caterpillar moth.

As the black tern has been described as a scarce summer visitant in British Columbia it has seemed advisable to tabulate the data in reference to the known colonies in the Cariboo Parklands. The population figures are approximate.

BLACK TERN NESTING COLONIES

Locality	Dates and numbers of adults
130 Mile Lake	July 28, 1931—20 Aug. 11, 1932—16 Aug. 3, 1936—20 June 26, 1941—50 June 15, 1942—30 July 12, 1943—30
Horse Lake, east end	July 26, 1936—40 July 17, 1937—12
Horse Lake, west end	July 27, 1936—20 July 17, 1937—10
Horse Lake, "Larum's Bay"	July 31, 1933—70 July 23, 1936—50 May 26, 1937—60
Buffalo Lake	Aug. 7, 1936—16
Longbow Lake	July 25, 1936—12
Lac La Hache, 121 Mile	Aug. 2, 1936— 8 July 12, 1943— 6
Lily Pad Lake	July 6, 1938—40 July 21, 1939—20 June 1, 1942— 6
Tatton Lake	July 22, 1939—10 June 11, 1940—20 July 13, 1941—24 June 3, 1942—none
"Nason's Slough," 121 Mile	July 11, 1938— 8 June 26, 1942— 2

BLACK TERN NESTING COLONIES—*Concluded*

Locality	Dates and numbers of adults
Succour Lake	July 13, 1938—24
Straight Lake	July 15, 1938— 8
Simon Lake	July 15, 1938—12
"Grus Lake"	July 18, 1938—30
Rail Lake	July 25, 1938—30
Anthony Lake	July 30, 1938—10
Jones Lake	July 29, 1942— 2 July 22, 1943— 6
Williams Lake, east end	June 5, 1937—20 July 4, 1938— 4 June 2, 1941—32 July 2, 1942—12
Williams Lake, west end	June 2, 1942—40

Mourning Dove. *Zenaidura macroura* (Linnaeus).—Reported from Clinton by Rhoads (23) and two were seen at Buffalo Lake, Aug. 28, 1933. It might be expected to occur in the Lac La Hache Valley but so far has escaped observation.

Horned Owl. *Bubo virginianus* (Gmelin).—Horned owls have been heard calling at different places. For example: 158 Mile, July 29, 1931; Lac La Hache, Aug. 15, 1932, May 10, 1943; Horse Lake, May 12, 1943. They were common at Buffalo Lake during September and October in 1932 and 1933. Mr. L. Jobin reported two nests in the Horsefly district; from these half-grown young were taken on Apr. 22, 1942.

Snowy Owl. *Nyctea nyctea* (Linnaeus).—Seen occasionally in winter along the Lac La Hache Valley (Forbes).

Hawk Owl. *Surnia ulula* (Linnaeus).—There was an invasion of hawk owls in the winter of 1943-44, the first being seen at Williams Lake on Nov. 1, 1943. Mr. Jobin reported seeing as many as nine on one day; he obtained a close-up photograph of one on Nov. 15, 1943. A specimen collected by him at Williams Lake, Feb. 25, 1944, is in the University of British Columbia collection.

Pygmy Owl. *Glaucidium gnoma* Wagler.—One heard at Lac La Hache on July 23, 1938; otherwise recorded only during September. Four specimens, all males, were collected as follows: Tatton Lake, Sept. 15, 1939—1; 122 Mile, Lac La Hache, Sept. 30, 1940—2; Sept. 18, 1942—1. These do not differ materially in measurements, shade, or pattern from a series of 11 Okanagan Valley specimens. The latter have been identified provisionally as the race *G. g. grinelli* Ridgway.

The stomach of one specimen, Sept. 15, 1939, contained portions of a vole, *Microtus pennsylvanicus*, 100%; the other stomachs were empty.

Great Gray Owl. *Scotiaptex nebulosa* (Forster).—On Sept. 28, 1932, at 87 Mile I found a dead great gray owl hanging in a bush. It had been shot, presumably near that place.

Long-eared Owl. *Asio wilsonianus* (Lesson).—I have examined several photographs of a long-eared owl taken near Williams Lake on May 11, 1944, by Jobin. This is the only record known to me.

Short-eared Owl. *Asio flammeus* (Pontoppidan).—A photograph by Stewart of a dead short-eared owl, shot by a hunter at Green Lake some time in July, 1942, has been examined. Jobin reports seeing the species numerous times near Williams Lake and he obtained a photograph there in March, 1942.

Richardson Owl. *Cryptoglaux funerea* (Linnaeus).—Included on the basis of several sight observations by Jobin at Williams Lake in winter.

Saw-whet Owl. *Cryptoglaux acadica* (Gmelin).—One photographed at Clinton by Stewart in April, 1940. Jobin reported it common at Williams Lake in the winter of 1943-44 and obtained successful photographs.

Nighthawk. *Chordeiles minor* Forster.—Common summer visitant. The earliest dates of arrival noted are: Horse Lake, May 30, 1937; Lac La Hache, May 28, 1941. An early southern migration was observed at Horse Lake, Aug. 19, 1937, when approximately 50 were seen flying over different parts of the lake. The latest record is Horse Lake, Sept. 2, 1933.

On a wooded hillside near 121 Mile, June 16, 1942, a female was flushed from two eggs lying on soft ground covered with fir needles near the base of a tall Douglas fir.

Three specimens, all killed on the Cariboo Highway by cars, have been examined and are identified as *C. m. minor* (Forster).

Black Swift. *Nephoecetes niger* (Gmelin).—Observed at intervals during the summer, usually on dark, cloudy days, the earliest record being May 26, 1937, at Horse Lake. A migration involving some 40 birds was noted at the same place, Aug. 19, 1937. Several hundred on migration were seen at Buffalo Lake, Aug. 30 and Sept. 2, 1932. On July 18, 1939, in the late afternoon two flew along the shore of Lac La Hache at 122 Mile; it is also reported from that place by Rhoads (23).

Vaux Swift. *Chaetura vauxi* (Townsend).—Rhoads (23) reported seeing Vaux swift at Lac La Hache, July 1, 1892.

Rufous Hummingbird. *Selasphorus rufus* (Gmelin).—Common summer visitant, nesting in suitable habitat throughout the district.

Calliope Hummingbird. *Stellula calliope* (Gould).—A male found dead at Lac La Hache, May 16, 1943, and sent to me in the flesh is the only record.

It is known to nest near Quesnel and in other localities north of the Cariboo Parklands.

Belted Kingfisher. *Megaceryle alcyon* (Linnaeus).—Regular summer visitant to many of the larger lakes. Earliest date of arrival noted is May 4, 1943, at Lac La Hache; last seen, Buffalo Lake, Oct. 12, 1933.

Red-shafted Flicker. *Colaptes cafer* (Gmelin).—Common summer visitant; earliest date observed at Lac La Hache, Apr. 3, 1944 (Geo. Forbes). At the time of my earliest visit to the district, Apr. 16, 1941, flickers were present and preparing to nest. A southward migration has been observed during September at various places, as at Lac La Hache, Sept. 9, 1942, and Horse Lake, Sept. 23, 1937. Birds conspicuously yellow on the undersurface of wings and tail are seen regularly and specimens examined show, in varying degree, an admixture of *C. auratus*. The details of four adult specimens are discussed later.

At Springhouse Prairie in May, 1942, four nests came under the somewhat casual review that other activities permitted; the observations are summarized as follows:

Nest No. 1. Entrance 20 ft. from ground in tall, green aspen; male—normally coloured *cafer* with red malar stripe; female—yellow underwings, tail yellow with one red feather. May 25, male flushed from nest at 10.30 a.m. and 12.00 noon; female not seen. May 27, 9.00 a.m., male on nest, female in nearby woods; later both were together in nesting tree. May 28, 9.30 a.m., female on nest.

Nest No. 2. Entrance 15 ft. from ground in aspen with broken top in open field close to woods. Male—normal red *cafer*, red malar stripe; female not seen. Male flushed from nest on May 26, 11.00 a.m.; May 27, 9.30 a.m.; May 28, 10.30 a.m.

Nest No. 3. Entrance 15 ft. above ground in tall green aspen. Male—normal red *cafer*; female—yellow underwings and tail, throat as in *cafer*. May 27, 2.30 p.m., female flew out when disturbed by raps on tree but returned to the nest a few minutes later. May 29, 8.00 a.m., female called at entrance hole and male relieved her on nest; when disturbed a few minutes later he acted as the female had done the day before, that is, he left the nest and returned soon after.

Nest No. 4. Entrance eight feet above ground in green aspen. Both birds normal *cafer* so far as could be seen. May 28, 9.00 a.m., female on nest.

COLOUR PATTERN OF FOUR ADULT FLICKERS

♀ Springhouse,	May 30, 1942.	Remiges and rectrices as in *Colaptes auratus;* throat grey with admixture of fawn next to black crescent; dorsal surface as in *C. cafer collaris.*
♀ Lac La Hache,	June 8, 1942.	Typical *C. cafer collaris.*
♂ Lac La Hache,	June 25, 1942.	Remiges and rectrices as in *C. cafer;* throat a mixture of grey and fawn; malar stripe red with slight admixture of black; dorsal surface typical *C. c. collaris.*
♂ Horse Lake,	Sept. 23, 1937.	Typical *C. cafer;* the dorsal surface intermediate in shade between *C. c. cafer* and *C. c. collaris.*

Pileated Woodpecker. *Ceophloeus pileatus* (Linnaeus).—Recorded from Horse Lake, Lac La Hache, and other localities; presumably it is resident in the general region.

Lewis Woodpecker. *Asyndesmus lewis* Gray.—Scarce summer visitant, nests near Williams Lake, where a brood of young was seen Aug. 3, 1937. Young birds have been photographed at the same place by Jobin. One on migration recorded near 105 Mile Lake, May 9, 1942, and another at 133 Mile, June 12, 1942. Last seen, Buffalo Lake, Sept. 13, 1933.

Yellow-bellied Sapsucker. *Sphyrapicus varius* (Linnaeus).—Summer visitant but not particularly common and restricted usually to a habitat in which aspen predominates. Early dates of arrival are May 2, 1944, at Clinton and May 7, 1943, at Lac La Hache; the latest date seen is Sept. 21, 1939, at Lac La Hache. A male with brood-patch, taken at Springhouse Prairie, May 28, 1942, indicates an approximate nesting date. Full-grown young recently out of the nest were seen at 130 Mile, July 12, 1943, and at Tatton Lake, July 15, 1943. The latter were accompanied by an adult male. Thirteen specimens examined are typical of the race *S. v. nuchalis*.

The range of *Sphyrapicus ruber* (which is regarded as a species) and that of *Sphyrapicus varius nuchalis* may meet 50 miles or so to the north; at any rate the former is common at Quesnel and in the Bowron Lake region to the east. Quesnel is approximately 63 airline miles northeast of Williams Lake. With this in mind a careful search for examples of intergradation between these two sapsuckers has been carried on in the Cariboo Parklands. Up to the present only two possible examples have been taken, viz.; an adult male, Springhouse Prairie, May 28, 1942, and an adult male, Lac La Hache, May 7, 1943. In these specimens the red of the throat extends downward slightly beyond the black chest band, which is thus partially obscured, and in one there are a few reddish-tipped feathers on the back.

Hairy Woodpecker. *Dryobates villosus* (Linnaeus).—Common and presumably resident. An adult male with brood-patch, taken at Lac La Hache, May 2, 1943, indicates an approximate nesting date. A nest, 10 ft. from the ground in a live aspen at Westwick Lake, contained young on June 3, 1937 (20). Another, at Springhouse Prairie, approximately 25 ft. above the ground in a live aspen (the entrance 10 ft. above an occupied nest of red-shafted flicker) contained young on May 28, 1942. At each of these nests the male parent attended the young. At Lac La Hache, June 12, 1942, an adult female was seen feeding a young bird that clung to the trunk of a cottonwood tree. At Horse Lake, July 16, 1943, an adult male accompanied one full-grown young.

Two breeding males, Lac La Hache, May 2, 1943, June 11, 1942, and one adult female, Lac La Hache, Sept. 8, 1942, are within the measurement range (wing and culmen) of a series from the Okanagan Valley comprising five adult males and six adult females. These are considered as representative of the race *D. v. monticola* Anthony.

Downy Woodpecker. *Dryobates pubescens* (Linnaeus).—Observed occasionally in various localities. In 1942 the first, evidently on migration, was seen on May 5 at Lac La Hache. A juvenile, recently out of the nest, was taken at Horse Lake, Aug. 4, 1933. It is known to winter at Lac La Hache and in January, 1944, George Forbes caught and examined one that frequented the trees about the ranch buildings at 122 Mile. One was photographed by Jobin at Williams Lake in December, 1943. The single adult specimen available is indistinguishable from examples of *D. p. leucurus* (Hartlaub) from the Okanagan Valley.

Arctic Three-toed Woodpecker. *Picoides arcticus* (Swainson).—One collected at Buffalo Lake, Sept. 1, 1932, and others observed there several times during September, 1933. Photographed by Jobin at Williams Lake in the winter of 1943-44.

American Three-toed Woodpecker. *Picoides tridactylus* Linnaeus.—Reported from Clinton and northward without satisfactory evidence (1). Photographs of a male and female were taken by Jobin at Williams Lake in the winter of 1943-44. I have searched unsuccessfully for this species each summer and now believe it to be a winter visitant only.

Eastern Kingbird. *Tyrannus tyrannus* (Linnaeus).—Abundant summer visitant. Here as elsewhere it is partial to nest sites near water. At Horse Lake in 1936 a pair nested in one of the few remaining branches of a derelict spruce that had become anchored in a horizontal position about 20 yd. from the shore of a shallow, muddy bay. The nest contained four young on July 25. Dates for nests with eggs are: San Jose River, June 26, 1941, July 12, 1943; Bridge Creek, July 18, 1943. Last seen, Buffalo Lake, Sept. 9, 1933.

Western Kingbird. *Tyrannus verticalis* Say.—For a number of years one or more pairs have nested within the limits of Williams Lake village, the site in several years being one of the crossbars on a telephone pole. Young in the nest were photographed by Jobin on July 12, 1943. This is probably the most northerly record for British Columbia; it has not been observed elsewhere in the Cariboo Parklands.

Say Phoebe. *Sayornis saya* (Bonaparte).—At Horse Lake, Aug. 23, 1940, one was seen flying from post to post along a fence enclosing a meadow and at Buffalo Lake a single bird was observed Aug. 24, 1933. These are the only records.

Alder Flycatcher. *Empidonax trailli* (Audubon).—Summer visitant. Specimens taken at Horse Lake and 130 Mile; sight records at numerous other places. A nest, two feet from the ground in a willow at Cumming's Lake, was made of fine grass lined with horse hair and contained two eggs on June 29, 1942.

Hammond Flycatcher. *Empidonax hammondi* (Xantus).—Common summer visitant. Earliest date recorded, Horse Lake, Apr. 30, 1943. Specimens taken at Horse Lake and Lac La Hache.

Wright Flycatcher. *Empidonax wrighti* Baird.—Common summer visitant. Earliest date seen May 4, 1943, at Lac La Hache. Last seen in autumn, Sept. 14, 1942. Both records are substantiated by specimens.

Western Wood Peewee. *Myiochanes richardsoni* (Swainson).—Common summer visitant. Earliest date seen, May 23, 1942, at Springhouse. A specimen taken at Horse Lake, May 29, 1937.

Olive-sided Flycatcher. *Nuttallornis mesoleucus* (Lichtenstein).—Seen or heard throughout the summer in numerous localities.

Horned Lark. *Otocoris alpestris* (Linnaeus).

O. a. articola Oberholser.—Transient, seen only once in spring, viz.; Elliott Lake, May 3, 1944—3. Common in autumn; earliest date recorded, Lac La Hache, Sept. 7, 1942. Specimens taken at Horse Lake, Sept. 17 to Sept. 22, 1933, and at 103 Mile Lake, Sept. 11, 1942.

O. a. merrilli Dwight.—Summer visitant at Riske Creek, where adults and young in first plumage were taken Aug. 3, 1937. In June, 1941, it was fairly common and nesting on Springhouse Prairie. Males sang from boulder tops and females were flushed from the ground, but a nest was not located until July 10. In the evening of that day two of us watched a pair, each with a grasshopper in its bill, walking through the short grass and tufts of pasture wormwood, *Artemisia trifida*. For a time they were uneasy and did not approach the nest closely. Finally the female, lost sight of for a moment against the neutral background of the earth, evidently visited the nest and when next seen was in flight. The male continued to walk back and forth for several minutes, then suddenly stopped and lowered his head. We then made out a nest completely filled by four fledglings. In repose and huddled together—heads withdrawn and eyes closed—they presented the appearance of a single, tawny-grey object, the solid colour broken by four darker V marks that were the bills and gapes. Two days later in the hot afternoon sun only one young was in the nest, the three others crouched in the shade of a small wormwood six inches away.

Violet-green Swallow. *Tachycineta thalassina* (Swainson).—Not seen by me but Jobin reports that in 1940 a pair of this species and a pair of tree swallows nested in a shed beside his house at Williams Lake.

Tree Swallow. *Iridoprocne bicolor* (Vieillot).—Common summer visitant; earliest date observed at Lac La Hache, Mar. 27, 1944 (Geo. Forbes). In 1943 migrations were noted as late as Apr. 30 and May 5 at Lac La Hache and on May 11 at Horse Lake. In early morning these transient flocks were clustered at the tops of leafless aspens by the lake shore. On the earliest dates mentioned the local population was in possession of the nesting trees. At Springhouse Prairie in 1942 nesting pairs used old flicker nests that had been excavated in live aspens and there were two instances where a pair of tree swallows and a pair of flickers occupied the same tree. In both trees the distance between the entrances to the nests was approximately three feet. A

nest at Springhouse Prairie, June 20, 1911, three feet from the ground in an aspen, was composed of feathers from at least five species of ducks and from sandhill crane (18). A nest with four eggs, Bridge Lake, June 24, 1935, was built in an old nest of a Bonaparte gull situated 20 ft. from the ground in a spruce tree. The gull's nest, made of spruce twigs, was broken down to a fairly compact mass and a small cavity in one side lined with feathers constituted the swallow's nest (6).

Rough-winged Swallow. *Stelgidopteryx ruficollis* (Vieillot).—Summer visitant. Earliest dates seen are May 4, 1944—8, at Williams Lake and May 5, 1943, at Tatton Lake. An excavation for gravel by the roadside at 122 Mile has created a bank in which several pairs nest each year. In 1942 the first were seen entering a nest cavity there on June 8.

Barn Swallow. *Hirundo erythrogaster* Boddaert.—Common summer visitant. Earliest date seen May 20, 1942, at Springhouse Prairie. It nests in many of the barns and unoccupied log buildings in the district and at Bridge Creek a nest built on one of the beams that support a low bridge over the stream contained eggs on July 16, 1937. At Horse Lake in July, 1943, it was observed that for a week after one of several broods had started flying the young returned each night to the nest and roosted there.

Cliff Swallow. *Petrochelidon albifrons* (Rafinesque).—Abundant summer visitant. Earliest date seen, Apr. 19, 1941, at Lac La Hache. Large colonies nest in many of the log barns along the Cariboo Highway and the birds have been seen carrying mud for their nests as early as May 8. In early May it is not unusual to see large numbers in a closely-knit flock ascend upward in a spiral and, high in the air, twist, turn, and perform various evolutions. Or the flock, moving as a unit, may descend close to the earth and without losing its unity pass amongst dozens of other swallows flying singly.

Great concentrations of adults and young on the telephone wires along the roadside are common sights in July. At Lac La Hache in 1943 the first gathering, about 200, took place on July 12. In this flock some of the young were being fed by their parents. The largest concentration, approximately 1200, was observed on July 21, 1943. Twenty miles farther north on the following day another flock of 300 $\pm$ was recorded.

Canada Jay. *Perisoreus canadensis* (Linnaeus).—Common resident. Five adult specimens taken at Mirage Lake and 122 Mile, Lac La Hache, cannot be separated from Okanagan Valley specimens and apparently are referable to *P. c. connexus* Aldrich.

The stomachs of four specimens from Lac La Hache, Sept. 20, 1939, contained several adults and pupae of a large dipterous insect, fragments of small beetles and other insects, seeds of wild rose and waxberry, and comminuted vegetable matter.

Black-headed Jay. *Cyanocitta stelleri* (Gmelin).—One seen at Watson Lake, Sept. 19, 1942, and two at Horse Lake, Sept. 20, 1933, are the only personal

observations. It was observed at Buffalo Lake on the following dates, viz.; Sept. 6, 1932, Sept. 18, Oct. 5, Oct. 8, 1933. Jobin reports that during one winter it was common at Williams Lake. Rhoads (23) collected one specimen at Clinton in 1892. This is recorded as *C. s. annectens* (Baird).

Magpie. *Pica pica* (Linnaeus).—Reported by Jobin to nest along the Fraser River south of Chimney Creek. Unknown in summer at localities east of the Fraser River but a few appear there in autumn: Lac La Hache, Sept. 14, 1942—1; Horse Lake, Sept. 20, 1933—1; Watson Lake, Sept. 21, 1942—3. It was more plentiful at Buffalo Lake where in 1932 the first was recorded on Sept. 25, in 1933 on Sept. 19. In the latter year it was noted as common on Sept. 23. It winters regularly at 122 Mile, Lac La Hache, and probably does so on other cattle ranches in the parklands.

Raven. *Corvus corax* Linnaeus.—Hypothetical, included on the basis of a statement by Rhoads (23) that ravens were scarce at Lac La Hache in 1892. I have seen none in summer and have obtained no evidence of its occurrence in winter.

American Crow. *Corvus brachyrhynchos* Brehm.—Common in summer in the Lac La Hache Valley, Springhouse Prairie, and other districts containing large areas of grasslands. Mr. Gilbert Forbes has noted the earliest arrival at Lac La Hache on Feb. 27, 1943.

The Lac La Hache Valley is an important migration route in autumn and large flocks assemble there in September. On Sept. 17, 1939, two flocks totalling 250 ± flew low over the aspen woods near the lake shore and later in the day some of these settled on open grasslands and fed upon grasshoppers. In this district the most common nesting trees are aspens and willows. A nest at Lac La Hache, that contained five eggs on May 8, 1943, is typical. Situated 10 ft. from the ground in a thick clump of willows, it was strongly built of sticks and twigs, the deep cup lined with shredded cottonwood bark fibres and a few feathers.

At Springhouse Prairie, June 1-20, 1941, the crow population in an area of approximately six square miles was 15 pairs. Frequently members of the population were seen hunting along shore or carrying food to their nests in the numerous aspen groves on the prairie. When young had reached the flying stage in late June the entire population moved to the adjacent wooded ridges and subsequently only a few visited the valley. In the period May 18-29, 1942, a comparative scarcity was apparent, nine being the largest number counted in one day. That year crows were more abundant six miles north at Westwick Lake, where the count was 24 on May 19.

At Lac La Hache, where some grain is grown, crows were relatively abundant. An undetermined number nested in the cottonwoods along shore as well as in the willow swamps and young out of the nest first appeared on June 28. There are many records of early summer flocking, the earliest June 8, 1943, when at 7.45 p.m. a flock of 46 flew along Lac La Hache about a quarter mile from shore. At 103 Mile Lake on July 13 of that year an un-

usual sight was presented by a flock of 120 ± milling about at a height of 200 to 300 ft. above the lake. A few minutes later they flew northward and disappeared over the forest. Usually crows are most conspicuous in the Cariboo Parklands after the conclusion of the nesting season in late June. From then until autumn the presence of large numbers hunting grasshoppers on the open range is a familiar sight.

In 1941 and 1942 the problem of crow–waterfowl relationship was given particular attention. In this ranching country much of the best nesting ground for waterfowl, on both privately owned and government land, is summer-pastured by stock and, in consequence, their waterfowl potential is never fully realized. Other adjacent fenced areas of natural hay meadow are not pastured until late autumn and these are more productive.

The following evidence of egg-eating by crows was obtained in connection with a total of 39 duck nests examined:

SPRINGHOUSE, 1941

Green-winged Teal.—A nest in sedge cover contained a single egg on June 15. When it was next visited on June 18 it was seen that the contents of the egg had been eaten, presumably by a crow.

Shoveller.—A nest exposed in short grass contained 10 eggs on June 11. These were eaten on or before June 15.

Canvas-back.—One of two fresh eggs laid in a nest that young had vacated was eaten about July 5.

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Shoveller.—Nest in grass clump 12 in. from beaten horse trail; surrounding cover grazed close; shells of six or more eggs scattered, two of them six feet from nest.

Lesser Scaup Duck.—Nest conspicuous in open patch of rush on hard shore; shells of five eggs in nest and two close beside it.

Ruddy Duck.—Nest on flattened mass of old round-stem bulrush, no cover; shells of five eggs in nest (Fig. 24).

Ruddy Duck.—Shells of seven eggs on shore—one on top of a flat rock, probably taken from well-concealed nest in bulrushes 30 ft. distant.

In addition to the ducks' eggs eaten in or near the nest, the following instances of egg-eating were recorded at Springhouse in 1942. Five eggs of horned grebe in a nest on an open pond were taken about June 18; two eggs of western meadowlark eaten in nest, May 19; one killdeer's egg-shell on ground, May 28; one pintail's egg-shell on ground, May 28. At Cumming's Lake, June 29, four baldpate egg-shells were found under a willow near the lake shore. These observations, and others made in the Cariboo Parklands in earlier years, suggest that the destruction of ducks' eggs by crows is much greater on pastured lands, or on lands where the cover is slight, than it is on hay lands and unpastured lands generally.

No specimens have been examined, but presumbly the race represented is *C. b. hesperis* Ridgway.

Clark Nutcracker. *Nucifraga columbiana* (Wilson).—A flock of seven was seen near Clinton on Sept. 21 and Sept. 22, 1934. Rhoads reports it as rare at Clinton and Lac La Hache (23). Jobin informed me it was abundant at Williams Lake in the winter of 1939-40. He obtained a photograph on Feb. 15, 1940.

Black-capped Chickadee. *Penthestes atricapillus* (Linnaeus).—Common in summer and autumn; its status in winter is not known. Troupes that appeared to be on migration were seen at Lac La Hache, Apr. 30, 1943. One specimen collected at Lac La Hache, Sept. 23, 1939.

Mountain Chickadee. *Penthestes gambeli* (Ridgway).—Common in the lodgepole pine and aspen forests in summer and autumn; its status in winter is not known. Two specimens taken at Lac La Hache, one, a juvenile, on July 30, 1933.

Red-breasted Nuthatch. *Sitta canadensis* Linnaeus.—Common and widely distributed in summer; known to winter commonly at Lac La Hache and probably does so throughout the region. A juvenile in first plumage was collected at Lac La Hache on each of the following dates, viz.; June 11, 1942, June 21, 1943.

Brown Creeper. *Certhia familiaris* Audubon.—One seen at Horse Lake, Aug. 1 and another on Aug. 6, 1933, are the only records.

Dipper. *Cinclus mexicanus* Swainson.—A pair nested on 100 Mile Creek not far from the 100 Mile House in 1942. Seen by Jobin at Alkali Creek and Williams Creek in winter and photographed by him at the latter place in 1943.

Long-billed Marsh Wren. *Telmatodytes palustris* (Wilson).—Abundant summer visitant, arriving in spring while there is yet no green showing in the marshes. The earliest date recorded is May 1, 1943, at 105 Mile Lake. The stems of round-stem bulrush is the material most commonly used in nest construction and nests of this type have been examined in many marshes. A number of departures from the commonplace require special mention; thus a population at Westwick Lake, July 7, 1941, used ducks' feathers extensively—one nest contained a total of 491, in addition to a large amount of down. Feathers and down combined represented about one-third of the total material in the nest, the remainder being dry, round-stem bulrush and sedge (17). Another nest in a bulrush marsh at 103 Mile Lake was made exclusively of filamentous algae (19). Nests made of flat sedges woven around willows have been examined at Lac La Hache and Horse Lake. At the latter place, July 15, 1943, two nests, eight feet apart and six feet above the water, were fastened to upright willow branches—in one five and in the other six branches were used as supports. The basic material in both nests was a narrow sedge; one

was lined with willow cotton, in the other this had been used around the entrance and in the outer fabric.

At Tatton Lake, July 15, 1943, young had reached the flying stage. One with filaments of down still attached to the head was examined at close range.

A series of seven specimens are plainly referable to the subspecies *T. p. plesius* (Oberholser).

Catbird. *Dumetella carolinensis* (Linnaeus).—Scarce summer visitant. Sight records at Bridge Creek, July 26, 1936 (adult with young), and at Williams Lake, July 26, 1943 (one adult).

American Robin. *Turdus migratorius* Linnaeus.—Common summer visitant and one of the most abundant birds in spring when transients are passing through. Earliest date recorded is Mar. 9, 1944, at Lac La Hache (Geo. Forbes). In 1943 a large migration took place at Lac La Hache between May 1 and May 9, at a time when the local population was beginning to nest. Through this period it was common to see numbers spread out over the open fields where they seemed to find ample food. Similar migrations were observed at Horse Lake, May 10 to 13, 1943.

Numerous nests in various locations have been examined; one at Tatton Lake, May 12, 1942, built low down in a willow, was lined with bright yellow grass and against this background the three blue eggs glistened conspicuously.

When I arrived at 122 Mile, Lac La Hache, on Sept. 7, 1942, the local robin population had left. Four transients appeared on the following day and, on Sept. 17, 10 were counted. These few apparently were in advance of the main migration, which took place during the latter part of the month. There is one record of robins wintering. Mr. L. Jobin saw two at the junction of Chimney Creek and the Fraser River on Dec. 26, 1943, and subsequently until January 15, 1944. On the earlier date they were feeding on juniper berries.

Three specimens taken at Lac La Hache, viz.; June 25, 1942—2; Sept. 17, 1942—1, are of the subspecies *T. m. propinquus* Ridgway.

Varied Thrush. *Ixoreus naevius* (Gmelin).—Seen or heard only in spring and autumn; sight records are: Horse Lake, May 10, May 12, 1943; Lone Butte, Sept. 26, 1940; Lac La Hache, Mar. 27, 1944, Sept. 17, Sept. 20, 1942. Dates of first appearance in autumn at Buffalo Lake are: Sept. 11, 1932, Sept. 13, 1933.

Hermit Thrush. *Hylocichla guttata* (Pallas).—A hermit thrush is a summer visitant to the lodgepole-pine–aspen habitat and is more common at Horse Lake, altitude 3600 ft., than at Lac La Hache, which is a thousand feet lower. The earliest dates on which they were seen are: Lac La Hache, May 9, 1943; Horse Lake, May 12, 1943. Dates for juveniles about three-quarters grown collected at Horse Lake are July 19, 1937, July 21, 1937.

It is believed that nowhere else in southern British Columbia does a hermit thrush population nest at such low elevations. Two adult males, Lac La

Hache, June 11, 1942, Horse Lake, May 31, 1937, and a male in first winter plumage, Lac La Hache, Aug. 24, 1937, apparently do not represent the race that nests in a timberline habitat in southern British Columbia and to which the name *H. g. sequoiensis* (Belding) is currently applied; neither can they be ascribed to the eastern race *H. g. faxoni* Bangs and Pennard as were specimens taken at Lac La Hache by Rhoads (23). The latter name, however, appears applicable to four males in first winter plumage, representatives of an autumn migration through the parklands that takes place after the local nesting population has left. Dates for the capture of these specimens are Horse Lake, Sept. 19, Sept. 20, Sept. 22, 1933; Lac La Hache, Sept. 10, 1942. At Buffalo Lake in 1932 the migration peak appeared to be on Sept. 10; in 1933 hermit thrushes were plentiful between Sept. 4 and Sept. 16; the last were seen on Sept. 25.

Olive-backed Thrush. *Hylocichla ustulata* (Nuttall).—Locally common. Earliest arrival noted at Horse Lake, May 26, 1937. Males in the woods at Tatton Lake were in full song on July 15, 1943. Noted as "fairly common" at Buffalo Lake, Aug. 30 to Sept. 7, 1932, and one specimen was collected.

Wilson Thrush. *Hylocichla fuscescens* (Stephens).—One heard singing at Lac La Hache, June 2, 1942, and reported by Rhoads as nesting there (23). Recorded also, by sight, from Buffalo Lake in August, 1932.

Western Bluebird. *Sialia mexicana* Swainson.—Two broods accompanied by parents were observed at Lac La Hache, July 30, 1936. At Buffalo Lake, Sept. 5, 1933, a number were seen on the ground in a hay field in company with vesper sparrows. No specimens were collected.

Mountain Bluebird. *Sialia currucoides* (Bechstein).—Common summer visitant and on migration one of the more conspicuous birds along the Cariboo Highway. The roadway is a resort also for broods of young and numbers are seen there on fences and telephone wires during July and August. The earliest and latest dates for Lac La Hache are: Mar. 9, 1944, Oct. 24, 1938.

Townsend Solitaire. *Myadestes townsendi* (Audubon).—Resident, not common. Sight records on May 14, 1943, at 85 Mile, Lone Butte, and Horse Lake and at Fawn Lake, Sept. 25, 1940. One seen by Jobin at the junction of Chimney Creek and the Fraser River on Dec. 26, 1943; this bird in company with two robins was feeding on juniper berries. The same observer photographed a parent solitaire feeding fledgling young in the nest at Whiskey Creek, 13 miles north of Williams Lake, on June 10, 1941. At the same place on the same date a nest with eggs and a nest with naked young were found.

Golden-crowned Kinglet. *Regulus satrapa* Lichtenstein.—Two seen at Lac La Hache, Apr. 30, 1943, were in company with migrating Audubon warblers. The species is common from May to September; its status as a winter resident is unknown. A juvenile in moult from first plumage was collected at Lac La Hache, Aug. 6, 1932.

Ruby-crowned Kinglet. *Corthylio calendula* (Linnaeus).—Common summer visitant; the earliest dates seen at Lac La Hache are Apr. 2, 1944, and Apr. 16, 1941. In 1943 it was first noted there on Apr. 30, when some 30 birds on migration flew from tree to tree along the shore. That day also the clear, emphatic song, so characteristic a sound in the woods through May and June, was first heard. (One was heard singing at Horse Lake as late as July 21). Another migration was in progress at Horse Lake on May 10, 1942, and 35 ± were counted in the willows and alders along half a mile of lake shore. The next day it was much less common.

An autumn migration was noted in the woods along Lac La Hache, Sept. 17, 1939; although only a total of 12 was counted this was the commonest species met with that day. Another migration was observed at the same place in September, 1942, the first indication of the movement being apparent on Sept. 8. Later it became much more common and to find six or eight together in one small thicket was not unusual. The last was seen that year on Sept. 19. Most of the transients encountered in both spring and autumn accompanied migrations of Audubon warblers.

Two adults and four juveniles from Lac La Hache and Horse Lake are referred to the race *C. c. cineraceus* (Grinnell).

American Pipit. *Anthus spinoletta* Bonaparte.—Large flocks pass through the district in spring and autumn; the earliest date seen in spring at Lac La Hache is Apr. 16, 1941—30; the earliest date seen in autumn is Aug. 19, 1933—2, at Buffalo Lake. The latest recorded date in autumn is Oct. 3, 1940, at Lac La Hache.

In 1942 the first of the southern migration was noted at Lac La Hache on Sept. 7, when 40 birds were counted. On Sept. 10 many flocks were seen along the highway between 103 and 122 Mile, the largest migration I have witnessed at any time. The last were noted on Sept. 12.

In 1943 the first, 70 ±, were seen near Clinton on Apr. 29; another flock, 150 ±, was noted at 103 Mile Lake on May 1. For the five days following it was common, then the numbers diminished, the last counts, at Horse Lake, being May 10—35; May 11—5; May 12—2.

Bohemian Waxwing. *Bombycilla garrula* (Linnaeus).—A careful watch has been kept for this species, but it was seen only once—a single bird at the summit of Mount Begbie, Aug. 10, 1932. Jobin found it nesting 13 miles east of Williams Lake on Aug. 15, 1943, and obtained photographs. He also reports it wintering in numbers at Williams Lake in 1943-44. A small flock was observed at Buffalo Lake, Oct. 10, 1933.

Cedar Waxwing. *Bombycilla cedrorum* Vieillot.—Common summer visitant. A nest with eggs was found in a willow swamp at Horse Lake, Aug. 3, 1934, and pairs apparently nesting have been seen at Lac La Hache, Cumming's Lake, Jones Lake, and elsewhere. Latest autumn record, Buffalo Lake, Sept. 13, 1933.

Northern Shrike. *Lanius borealis* Vieillot.—A regular transient and winter visitant. At Buffalo Lake in 1932 the first autumn migrant was seen during the first week in October; subsequently one was recorded daily until Oct. 19; none was seen there in 1933. Jobin photographed one near Williams Lake on Nov. 23, 1943, and reported that in the spring of 1944 the last shrike was seen on Apr. 1.

Solitary Vireo. *Vireo solitarius* (Wilson).—Summer visitant, not common. The earliest date recorded is May 3, 1943, at Williams Lake; the latest, Horse Lake, Sept. 18, 1933. There are sight records for Lac La Hache, amongst others one in which the subject carried a forest tent caterpillar in its bill. Two specimens taken at Horse Lake, Sept. 18, 1933, May 29, 1937, are of the subspecies, *V. s. cassini* Xantus.

Red-eyed Vireo. *Vireo olivaceus* (Linnaeus).—Common summer visitant. Its insistent song is heard from the aspen woods through all the summer even in the hottest part of the day. The earliest date recorded is June 4, 1942, at Lac La Hache.

Warbling Vireo. *Vireo gilvus* (Vieillot).—Common summer visitant. The earliest date recorded is May 10, 1942, at Lac La Hache; the latest, Sept. 15, 1933, at Buffalo Lake.

Tennessee Warbler. *Vermivora peregrina* (Wilson).—Seen on migration at Horse Lake, May 26, May 28, 1937, when several at close range were satisfactorily identified with 6× binoculars. At the same place, Aug. 4, 1933, at least two were observed in company with Audubon warblers. Reported as nesting at 158 Mile (1).

Orange-crowned Warbler. *Vermivora celata* (Say).—Regular summer visitant, common on migration. The earliest date recorded is at Lac La Hache, Apr. 30, 1943; the latest Sept. 20, 1933, at Horse Lake.

V. c. celata (Say).—This is the subspecies that nests in the region. An adult female with brood-patch was taken at Horse Lake, July 17, 1943. This bird was accompanied by young recently out of the nest. At 130 Mile, July 12, 1943, a male was seen and heard singing from the top of a slim spruce beside a marshy stream. Later, when he was observed carrying an insect, his actions suggested that young were being fed.

V. c. orestera Oberholser.—This subspecies is a transient in the district and less plentiful than *celata*. One specimen taken at Lac La Hache, May 8, 1943, another at Horse Lake, Aug. 6, 1943.

Nashville Warbler. *Vermivora ruficapilla* (Wilson).—Two sight records, viz.; Horse Lake, May 26, May 28, 1937.

Yellow Warbler. *Dendroica aestiva* (Gmelin).—Summer visitant, not common. Earliest date recorded is May 15, 1943. Latest date, Sept. 22, 1943, at Lac La Hache. Specimens taken at Horse Lake, Aug. 2, 1933, and May

28, 1937; Lac La Hache, Sept. 14, 1943. These are referred to the subspecies *D. a. aestiva* (Gmelin).

Myrtle Warbler. *Dendroica coronata* (Linnaeus).—At 122 Mile, Lac La Hache, in 1942 two myrtle warblers were seen, viz.; a male on May 11 and a female on May 15; both were with Audubon warblers. The following year a migration passed through the same place between Apr. 30 and May 10. During that period approximately 50 individuals, chiefly males, were identified and several of these were collected. The largest numbers were seen on May 7 and May 8, the counts for these days being 10 and 12, respectively. A total of four was observed and one specimen taken at Horse Lake during the period May 11 to 13, 1943. The last to be seen, a female, was noted at Lac La Hache on May 15.

Audubon Warbler. *Dendroica auduboni* (Townsend).—Common summer visitant widely distributed. The earliest dates seen at Lac La Hache are Apr. 4, 1944, and Apr. 16, 1941. A migration along the shore of Lac La Hache in 1942, observed between Apr. 30 and May 10, was of more than usual volume. On Apr. 30 it was estimated that 250 were in open aspen woods and fields along a three-mile stretch of lake shore. The males made vivid patches of colour against a background of short, tawny grass as dozens, fluttering down from the aspens, hunted insects over the open places. On this day the number of males exceeded the number of females in the ratio of 10 to one. On May 2 in a total of 30 counted 18 were females. May 4 was a cold, windy day and small birds, including many Audubon warblers, kept within the shelter of heavily-foliaged Douglas firs and in thick shrubbery. On May 7, a warm, sunny day, many kept flying for a short distance out over the lake; then returning quickly to the shore. The attraction over the lake appeared to be newly-hatched chironomids, thousands of which danced above the water. At Tatton Lake on May 5 approximately 30 Audubon warblers flitted about amongst the dead, broken-down rushes in the marsh.

An autumn migration at Lac La Hache came under observation in 1942 between Sept. 8 and Sept. 12. On the first date 50 were counted in open woods at the forest edge above the lake and between Sept. 12 and Sept. 15 larger numbers were seen there. They continued to pass through for the following three days, after which only an occasional small group was observed. The latest records are Lac La Hache, Sept. 26, 1940; Buffalo Lake, Oct. 18, 1933.

Townsend Warbler. *Dendroica townsendi* (Townsend).—Scarce transient. One specimen taken at Horse Lake, May 3, 1943; another at Lac La Hache, Sept. 12, 1942. On the latter date at least one other was seen. Observed at Buffalo Lake between Aug. 31 and Sept. 22, 1933.

Water Thrush. *Seiurus noveboracensis* (Gmelin).—Summer visitant, much less common than in the country immediately to the north. A female with full-grown young at "Disputed Lake," July 28, 1936, and a female at Horse

Lake, Aug. 7, 1937, are the only personally-made records. Several were observed at Buffalo Lake in late August and early September, 1933.

Macgillivray Warbler. *Oporornis tolmiei* (Townsend).—Summer visitant, not common. A specimen taken at Horse Lake, May 29, 1937. At the same place, July 20, 1943, a female with brood of nearly full-grown young was seen in a swampy thicket of alder and willow.

Yellow-throat. *Geothlypis trichas* (Linnaeus).—Common summer visitant. The earliest records are May 28, 1937, at Horse Lake and May 30, 1943, at Lac La Hache; the latest record, Sept. 20, 1933, at Buffalo Lake. An adult female was seen feeding young out of the nest at "Disputed Lake," July 28, 1936. Two adults from Horse Lake are identified as *G. t. occidentalis* Brewster.

Wilson Warbler. *Wilsonia pusilla* (Wilson).—Common transient. Its status as a summer visitant has not been determined. In 1943 the first appeared at Lac La Hache on May 2, four were seen there on May 4 and at least 10 on May 7. It was common at Horse Lake, May 10 to May 12, and on the latter date 15 were counted. The latest date seen is Sept. 17, 1933, at Buffalo Lake.

The subspecies represented is *W. p. pileolata* (Pallas).

American Redstart. *Setophaga ruticilla* (Linnaeus).—At Horse Lake, July 17, 1943, a female flying about amongst flooded willows was under observation for 10 min. Her behaviour indicated she had young in a nest close by. Other records are: Lac La Hache, Aug. 11, 1932; "Disputed Lake," July 28, 1936; reported as common at Buffalo Lake, where it was last seen on Sept. 10, 1933.

English Sparrow. *Passer domesticus* (Linnaeus).—Noted about the buildings of various ranches and at Williams Lake. It was reported that only a few survived a period of exceptionally low temperature in January, 1943.

Western Meadowlark. *Sturnella neglecta* Audubon.—Reported as very rare at Lac La Hache in 1892 (23), now a common summer visitant there and elsewhere in the grasslands. The earliest date seen, May 1 at Lac La Hache. A nest with four eggs at Westwick Lake was examined on June 5, 1941.

Yellow-headed Blackbird. *Xanthocephalus xanthocephalus* (Bonaparte).—Reports of ornithological observations in the Cariboo region 40 or 50 years ago suggest that the yellow-headed blackbird was uncommon there at that time. Rhoads (23) records it from Lac La Hache but as he considered the species as "casually breeding in British Columbia" the inference is it was not plentiful. Brooks (1) describes it as a rare straggler seen only at 158 Mile. The former scarcity of the species is corroborated by Mr. Gilbert Forbes, 122 Mile, Lac La Hache, who told me that he had no recollection of seeing yellow-headed blackbirds when he was a boy, which would be 40 odd years ago.

At present it is an abundant summer visitant to suitable marshes from 105 Mile north to 150 Mile and west to the Fraser River; observations during the period 1931 to 1932 indicate a considerable increase in numbers and expansion

of range during that time. It does not nest in the marshes on the Thompson River drainage north and east of the Cariboo Highway, the only record being the observation of an adult male at Horse Lake, May 27, 1937. Information concerning its status west of the Fraser River is not available. At Williams Lake the earliest date of first appearance is Apr. 20, 1944, the latest date seen, Sept. 9, 1941.

The following observations of life history were made in 1942: At Westwick Lake, May 20, where a colony of 30 pairs was established in a bulrush marsh, laying had recently started and only two nests held the complement of four eggs. One in process of construction contained strands of dry, filamentous algae amongst the flat rush material woven around eight stems of dry, round-stem bulrush.

A colony of 20 pairs at "Rush Lake," Springhouse Prairie, also were nest-building. Two completed nests held one egg each, four were empty, three others were in the process of construction. The outside material of the nests, woven to the dry stalks of round-stem bulrush, consisted of flattened pieces of small-sized stems of this plant, the linings being of bulrush strips averaging $\frac{1}{8}$ in. in width; the lowest was 10 in., the highest 22 in. above the water. One nest, a particularly fine example of basketry, measured 10 in. from base to rim, where the diameter was 4 in. The majority measured 5 to 6 in. in height.

Fourteen males were established on definite territories within a one acre island of round-stem bulrush. Each territory appeared to comprise 5 or 6 sq. yd., the calling perches being several tall bulrush stems. It was noted how closely the males remained within their respective territories and that several drove off intruding females but paid no attention to neighbouring males. The display flight of the male took place at short intervals in this manner: The bird flew up (climbed up) almost vertically for 100 ft. or more, then dropped, with wings outspread, sometimes for 25 ft. or so, to the perch from which it ascended. The females usually remained hidden at lower elevations in the marsh, but occasionally one perched on the top of a rush clump (Fig. 25).

This marsh appeared to be occupied to almost full capacity by yellow-headed blackbirds; only one pair of red-winged blackbirds was present.

Conditions were different in the marsh along the San Jose River for a mile above 130 Mile Lake. Here the growth is part *Typha*, part *Carex*, and part *Scirpus acutus*. On June 15 both yellow-headed blackbirds and red-winged blackbirds nested in the latter growth without noticeable segregation.

A colony of six pairs at 149 Mile Slough were late in nesting and were seen on June 23 copulating on the shore at the edge of the marsh. On this date two newly-built nests were empty, another contained three eggs, and a third three newly-hatched young. Males remained on their territory-perches after the females had left the nest. The first young out of the nest and about half-grown were seen at 103 Mile Lake on July 2.

After the young are fully fledged the marshes are deserted for the grasslands, where, in company with flocks of red-winged blackbirds and Brewer blackbirds, they spread out to feed on grasshoppers. With red-winged blackbirds they feed also on standing grain while it is still in the milk stage.

The expansion in numbers and in space noted in connection with this species would seem to have been accomplished at the expense of the smaller, and perhaps less aggressive, red-winged blackbird. The requirements of both species are identical, or at least similar, and there is competition for nesting sites and for food. Early comparisons of populations are not available; those made in 1942 are tabulated here as of interest for future reference.

POPULATIONS OF ADULT YELLOW-HEADED BLACKBIRD AND RED-WINGED BLACKBIRD IN 1942

Locality	Date	Yellow-headed blackbird	Red-winged blackbird
Westwick Lake	May 20	60	8
"Rush Lake"	May 21	40	2
Slough 1, Springhouse	May 27	0	4
Lily Pad Lake	June 1	10	0
Williams Lake, west end	June 2	16	12
Tatton Lake	June 3	6	4
105 Mile Lake	June 4	38	0
Williams Lake, east end	June 5	14	12
Watson Lake	June 13	26	1
San Jose River, at 130 Mile	June 15	26	22
103 Mile Lake	June 16	24	0
149 Mile Lake	June 23	16	0
Nason's Slough	June 26	2	6
Jones Lake	June 29	8	40

In 1943 the species appeared less common. The first to be recorded, 60 ±, of which at least 50 were females, were on telephone wires along the highway near 105 Mile on Apr. 29. Some of the marshes had smaller populations than formerly and through July it was observed that none accompanied the flocks of red-winged blackbirds and Brewer blackbirds as they hunted grasshoppers on the open range.

Red-winged Blackbird. *Agelaius phoeniceus* (Linnaeus).—Common summer visitant with much more extended range than the yellow-headed blackbird, which appears to be replacing it to some extent within a limited area. It is one of the earliest birds to arrive at Lac La Hache in spring and in 1944 was first observed on Mar. 2. On Apr. 30, 1943, two flocks totalling 20 were obviously on migration, these fed about the farm buildings and flew from there to the cottonwood trees on the lake shore. None was seen in an adjacent bulrush and cattail marsh until May 8.

It was stated earlier that red-winged blackbirds feed extensively upon grasshoppers and also upon standing grain. Migrating flocks also visit the grain fields late in the season after the crop has been harvested. At Lac La Hache on Oct. 3, 1940, a flock of 150 ±, in three detachments and accompanied

by Brewer blackbirds, appeared about 4.00 p.m. and immediately settled upon an oat stubble. For a time they associated with a smaller number of crows feeding on the field; they did not spread out but remained in a compact formation that from a distance appeared as a black mass on the ground. Influenced perhaps by the natural wariness of the crows, the blackbirds were equally wild and when approached all flew immediately to the tops of cottonwoods along the lake shore.

Mr. Gilbert Forbes told me that in the winter of 1942-43 a small number of red-winged blackbirds remained about his barn and apparently some survived, although in January the temperature dropped to 62° below zero. Mr. Jobin first noted it in winter at Williams Lake in 1938 and has seen it there in each of the succeeding winters.

Three adult males, Horse Lake, May 27, 1937; one adult male, Springhouse, May 28, 1942; two adult females, Lac La Hache, May 6, 1943, are considered to be nearest to the subspecies *A. p. arctolegus* Oberholser.

Bullock Oriole. *Icterus bullocki* (Swainson).—In the spring of 1941 several empty nests were seen in aspens near the buildings on the Alkali Lake Ranch, 26 miles southwest of Williams Lake village. It is reported that two pairs nest there each year. This is the only definite record.

Rusty Blackbird. *Euphagus carolinus* (Müller).—In an earlier paper (4) the nesting of the rusty blackbird at Horse Lake in 1933 was recorded on what appeared at the time to be satisfactory evidence, namely, the collecting, on Aug. 1 and Aug. 2, of two young in juvenal plumage and three young moulting to first winter plumage. No adults were taken. During a subsequent investigation, May 28, 1937, Brewer blackbirds were found nesting there and no rusty blackbirds were present. This has led me to suspect that the rusty blackbirds seen there in Aug., 1933, may have been early transients associated with a nesting colony of Brewer blackbirds. On Sept. 19, 1934, four young rusty blackbirds in first winter plumage were together in a willow thicket at the edge of a meadow at Horse Lake and one was collected. These were the only blackbirds present. Four were seen on the Cariboo Road near 100 Mile on Aug. 20, 1937. Two males in first winter plumage were taken at 103 Mile Lake, Sept. 11, 1942. These two and one other male were feeding along the lake shore with a large flock of Brewer blackbirds. A female in first winter plumage was collected at Buffalo Lake, Sept. 15, 1932, and others were seen there both in the autumn of that year and in the autumn of the following year.

Brewer Blackbird. *Euphagus cyanocephalus* (Wagler).—Abundant summer visitant, arriving in April and nesting during May and June. A nest at Westwick Lake containing five eggs on May 20, 1942, was on the ground 10 ft. from the water's edge under cover of a small weathered aspen branch. Another ground nest, deeply cup-shaped and containing five eggs on June 2, 1941, was concealed under a small, dead bush. A third, without eggs on June 22, 1941, was composed of grass and weed stalks with horsehair in the

lining. This was built in a thick clump of the previous year's growth of round-stem bulrush on the edge of a small slough. Both the latter nests were at Springhouse Prairie.

Early in July when the young are full-grown, much of the population gathers in flocks and, sometimes in company with red-winged blackbirds and yellow-headed blackbirds, forages over the grasslands. Here grasshoppers in various stages of development are the principal food and from July to September flocks of blackbirds may be observed moving over the open places, as they search out these insects, or rising in a cloud when disturbed by a passing traveller. In 1942 the earliest flocking was observed at Lac La Hache on June 29 and in 1937 a flock estimated at 400 was spread out over a wide stretch of grassland, intent upon hunting grasshoppers.

In the winter of 1942-43 a small number wintered in and about the buildings on the 122 Mile Ranch. The majority, perhaps all, were frozen when in January the temperature dropped as low as 62° below zero.

Cowbird. *Molothrus ater* Boddaert.—On May 14, 1942, four males and one female were together in a fenced enclosure at Ogden's Store, Lac La Hache. These were watched for several minutes at a distance of 10 ft. and less. An adult female was taken at Horse Lake, May 26, 1937, and a young bird was observed at "Disputed Lake," July 28, 1936. These are the only records. The subspecies represented is *M. a. artemisiae* Grinnell.

Western Tanager. *Piranga ludoviciana* (Wilson).—Summer visitant, not common. The earliest date seen is May 26, 1937, at Horse Lake; last seen Aug. 22, 1933, at Buffalo Lake. Several males were seen and heard singing at 122 Mile, Lac La Hache, June 8, 1942, and again on June 26. On July 12, 1943, a pair was observed in an aspen wood at the west end of 130 Mile Lake.

Evening Grosbeak. *Hesperiphona vespertina* (Cooper).—At Lac La Hache, May 29, 1942, an adult male came to the water's edge to drink, then flew into a nearby alder, where it remained for several minutes. This bird was under observation from a distance that at some times was less than 10 ft. A single bird was observed near Williams Lake on Aug. 2, 1937. On May 15, 1943, several were seen in the aspens on the L. Y. Ranch at Horse Lake. The record is based on a written description made at the time by Mr. Sigurd Larum. Observed occasionally in small flocks at Buffalo Lake in 1932 between Aug. 17 and Sept. 20 and in 1933 between Aug. 28 and Oct. 5.

Purple Finch. *Carpodacus purpureus* (Gmelin).—First recorded at 122 Mile, Lac La Hache, in 1942 when on May 27 an adult male was seen and heard singing in an aspen on the lake shore. On May 31 two adult males, one striped male and two adult females were in the same stand of aspens, feeding upon the green seeds still held in their protecting envelopes. The birds remained there for some time; both the adult and the immature males sang repeatedly, the song of the former being the more sustained. The following year an adult male was seen at the same place on May 2 and May 3; another adult male appeared on July 11 and a striped male on May 7.

An adult female collected on May 17, 1942, contained an egg in the oviduct ready to be deposited. This specimen, two adult males, May 31, 1942, May 15, 1943, and one striped male, May 7, 1943, are typical of the race *C. p. purpureus* (Gmelin).

Cassin Purple Finch. *Carpodacus cassini* Baird.—Identified with certainty only once, at 87 Mile, June 14, 1940. On this date a juvenile not fully grown was flushed from the ground close to the highway. It seemed to have been hurt, perhaps by collision with a car, and dropped to the ground after a short, weak flight. Close by in a serviceberry bush an adult male with crown feathers erect moved restlessly from twig to twig and finally flew down to the young bird and fed it.

Pine Grosbeak. *Pinicola enucleator* (Linnaeus).—Seen once only, an adult male and a female or immature male, at 108 Mile on Oct. 24, 1938. They were in a tall willow and were watched from a distance of only a few feet while they ate the leaves that perhaps had galls on them.

Rosy Finch. *Leucosticte tephrocotis* (Swainson).—On Oct. 20, 1938, just north of Clinton, four were flushed by a car as it passed a deep roadside excavation where the birds had been feeding or picking up gravel. On Oct. 24, 1938, a single bird was collected on the Timothy Mountain Road north of Lac La Hache. This proved to be *L. t. littoralis* Baird.

Hoary Redpoll. *Acanthis hornemanni* (Holboell).—Amongst the redpolls observed at Williams Lake a number were noted to be much paler in colour; two of this type found dead were identified by Jobin as hoary redpolls.

Redpoll. *Acanthis linaria* (Linnaeus).—Winter visitant. Earliest recorded date of arrival is Oct. 18, 1933, at Buffalo Lake, when several flocks were seen. Latest date recorded is Mar. 28, 1944, at Lac La Hache (Forbes). At Williams Lake a flock of 100 ± was observed by Jobin during the last week of February and the first week of March, 1944.

Pine Siskin. *Spinus pinus* (Wilson).—Occasionally common. A flock of 10 was seen at Springhouse Prairie, May 26, 1942, and at Lac La Hache between May 30 and June 15, 1942, small flocks appeared daily. A specimen was taken at Horse Lake, Aug. 18, 1936, and another at Lac La Hache, June 9, 1942.

Red Crossbill. *Loxia curvirostra* Linnaeus.—Noted at Williams Lake, Aug. 4, 1931; at Horse Lake, Aug. 5, 1933; at Tatton Lake, Sept. 18, 1939; and at 108 Mile, Sept. 21, 1938. Two males and a female collected at Tatton Lake, Sept. 18, 1939, had brood-patches and the condition of testes and ovaries suggested they had recently bred. One male in the red plumage when first seen was singing from the top of a willow at the edge of the forest. At Buffalo Lake several small flocks were observed on Sept. 16, 1932, and the following year this species was noted as "common" or "abundant" between Aug. 30 and Oct. 18.

Specimens collected at Horse Lake are identified as *L. c. bendirei* Ridgway.

White-winged Crossbill. *Loxia leucoptera* Gmelin.—At Horse Lake, Aug. 5, 1933, two specimens were collected from a flock of 12 that was feeding on green spruce seeds. This is the only record.

Spotted Towhee. *Pipilo maculatus* Swainson.—According to Rhoads, towhees "abundantly haunted the woodlands of the interior [of British Columbia] in all localities visited." The accuracy of this statement in respect of the Cariboo Parklands might be questioned but for the fact that two specimens are listed as taken at Lac La Hache (23). The species has not been seen by me.

Savannah Sparrow. *Passerculus sandwichensis* (Gmelin).—Common summer visitant, abundant on migration. In 1942 the migration at Lac La Hache was at its peak between May 11 and May 15. In 1943 the first was seen on Apr. 30; the species became common on May 5, when 30 were counted, and abundant on May 7. A nest at Springhouse Prairie contained four eggs on June 22, 1942. At Horse Lake, July 17, 1943, young out of the nest were being fed by their parents. Juveniles in first plumage were taken there July 21, 1937, and Aug. 2, 1933.

Vesper Sparrow. *Pooecetes gramineus* (Gmelin).—Summer visitant, not particularly common. At Lac La Hache, May 2, 1943, two were seen with migrating white-crowned sparrows, these being perhaps the first arrivals. Two days later a male was watched as it hopped through the grass, picking at minute objects on the ground and stopping every few feet to sing. On Sept. 12, 1942, one was seen accompanying a flock of white-crowned sparrows.

An adult female collected at Springhouse and a juvenile at Horse Lake, July 19, 1937, are the only specimens examined. These are identified as *P. g. confinis* Baird.

Slate-coloured Junco. *Junco hyemalis* (Linnaeus).—Amongst the migrating juncos at Lac La Hache several with the black head and slaty flanks characterizing the adult males of *J. h. cismontanus* Dwight have been observed; the exact dates are Apr. 19, 1941—1, Apr. 20, 1941—2. Adult males of this subspecies have been taken numerous times in southern British Columbia; they can readily be identified in the field. Authority for the use of the name *J. h. cismontanus* and for the application of the name *Junco oregonus montanus* to the juncos nesting in the Cariboo Parklands will be found in *Speciation in the avian genus Junco* by Alden H. Miller.

Oregon Junco. *Junco oreganus* (Townsend).—Abundant summer visitant, widely distributed. At Lac La Hache a migration in force was noted on Apr. 30, 1943, and autumn migrations involving large numbers were observed there on Sept. 8 and Sept. 15, 1942. The earliest recorded date of arrival at that place is Mar. 27, 1944 (Forbes). Young just out of the nest have been seen as early as June 4, 1942, and young in the nest, being fed insect larvae by the parents, on Aug. 3, 1936. Juveniles in first plumage were taken at Lac La Hache, June 25, 1942, and at Horse Lake, Aug. 6, 1933.

Three adult males and two adult females are indistinguishable from breeding specimens taken in the Okanagan Valley; these are identified as *J. o. montanus* Ridgway.

Tree Sparrow. *Spizella arborea* (Wilson).—Included on the basis of a sight record of two at Buffalo Lake, Sept. 30, 1932.

Chipping Sparrow. *Spizella passerina* (Bechstein).—Summer visitant; some years, as in 1942, very common. Earliest recorded dates of arrival, Apr. 30, 1943—1, May 11, 1942—4. It was noted when I arrived at Lac La Hache on Sept. 8, 1942, that all the adults apparently had left. Two young of the year seen on Sept. 10 were the only individuals recorded.

At Springhouse Prairie a large well-built nest six feet above the ground in the spreading branch of a lodgepole pine was discovered on May 26, 1942. One egg was laid each day from May 27 to May 30, after which it was not possible to follow its history. Adults feeding young out of the nest have been noted at Lac La Hache, June 25, 1942, Horse Lake, July 20, 1943, and 143 Mile, July 26, 1943.

An adult male, Lac La Hache, Apr. 30, 1943, and a juvenal male in first plumage, July 27, 1943, are similar in all details to specimens of *S. p. passerina* (Bechstein) in comparable plumage. As examples of the eastern race have apparently not been taken in southern British Columbia the conclusion that the Cariboo population of chipping sparrows reaches that region by way of an east–south route from east of the Rocky Mountains seems inescapable.

Clay-coloured Sparrow. *Spizella pallida* (Swainson).—Two collected by Brooks at 158 Mile, July 3, 1901 (2); identified as *Spizella breweri* in his earlier paper (1).

White-crowned Sparrow. *Zonotrichia leucophrys* (Forster).—Common summer visitant and abundant on migration. The earliest recorded date of arrival at Lac La Hache is Apr. 25, 1940—it arrived on the same date in 1944. On Apr. 30, 1943, approximately 200 were counted along a three-mile stretch of shoreline and it was still abundant there on May 8. Large numbers were observed along the highway between 122 Mile and Williams Lake village on May 3 and migrations were in progress at Horse Lake between May 10 and May 13. A large migration of young in first winter plumage was observed at Lac La Hache between Sept. 8 and Sept. 10, 1942. It was not so plentiful on Sept. 12 and in the following 10 days relatively few were noted. Only two adults were observed during this period. The latest date seen is Oct. 12, 1933, at Buffalo Lake.

The brushy thickets and open aspen woods on the shore of Lac La Hache are the home of a summer population and fledgling young are seen there in June and July. In 1943 a pair was seen feeding young on July 11; the male of this pair was heard singing as late as July 9. Young in first plumage were collected at Lac La Hache on June 25, 1942, and at Horse Lake on Aug. 1, 1933. In the latter place several pairs nested in a willow and dogwood swamp

that was occupied also by nesting song sparrow, Lincoln sparrow, yellow warbler, yellow-throat, and cedar waxwing (4).

The subspecies represented is *Z. l. gambeli* (Nuttall).

Fox Sparrow. *Passerella iliaca* (Merrem).—A fox sparrow identified as *P. i. schistacea* Baird was collected by Rhoads at Clinton. This appears to be the only record for the species.

Lincoln Sparrow. *Melospiza lincolni* (Audubon).—Summer visitant. In 1943 the first was seen at Horse Lake on May 10; others appeared during the three days following. These, like the song sparrows, accompanied the migration of white-crowned sparrows. The latest autumn record is Lac La Hache, Sept. 10, 1943. Lincoln sparrows apparently nest regularly in swampy ground at Horse Lake, as juveniles were taken there on July 27, 1937, and Aug. 2, 1933.

The subspecies represented is *M. l. lincolni* (Audubon).

Song Sparrow. *Melospiza melodia* (Wilson).—Common summer visitant. At Lac La Hache, May 11, 1942, and May 7, 1943, when pairs were established on territories and the males were singing, it was observed that transients were still passing through. The earliest recorded date of arrival at that place is Mar. 28, 1944 (Forbes). In 1942 an autumn migration was at its height on Sept. 9 and Sept. 10. Both spring and autumn migrations coincide with those of white-crowned sparrow and the two species appear to travel together. On Sept. 9, 1942, both species were seen feeding on standing wheat in a field that ended on one side at a barrier of brush into which the birds retreated when disturbed.

Fledgling young out of the nest have been collected at Horse Lake, July 18, 1937, and at Lac La Hache, Aug. 13, 1932, Aug. 4, 1938.

The song sparrow populations inhabiting the swampy meadows and willow swamps of higher altitudes are darker in tone, with darker coloured lower mandible, than those in the valleys. It may prove desirable to recognize two races, namely, *M. m. inexpectata* Riley, occupying the high meadows, and *M. m. merrilli* Brewster, occupying the lower levels.

Lapland Longspur. *Calcarius lapponicus* (Linnaeus).—Two were collected from a flock of 30 at Buffalo Lake, Sept. 24, 1933, and the species was seen in small numbers accompanying pipits until Oct. 18 of that year.

Snow Bunting. *Plectrophenax nivalis* (Linnaeus).—Observed by Stewart at Clinton in late autumn and by Jobin at Williams Lake in early spring; a photograph was taken by the latter during the first week of March, 1944. According to Forbes a flock remained all winter at Lac La Hache several years ago.

Appendix A

Localities referred to in text

The positions of localities given are from the Geographical Gazetteer of British Columbia, Government of the Province of British Columbia, Victoria, B.C., 1930. The indexing system used in this publication is explained as follows: "Each geographical quadrilateral of the earth's surface of 1 degree in extent in latitude and longitude is divided into the S.E., S.W., N.E. and N.W. quarters. The southeast corner of each quadrilateral gives the initial point for the figures of reference."

Anthony Lake.—Approximately 30 acres; 51° 121° N.E. An expansion of the north fork of 111 Mile Creek in a wild hay meadow. The shoreline is boggy and grown up with sedges, except for two small areas of round-stem bulrush, *Scirpus acutus*. Yellow pond lily forms a continuous belt 30 to 150 yd. wide around the entire lake. Mare's tail (*Hippurus vulgaris*), arrowhead, and bur-reed (*Sparganium* sp.) occur along the margin and the waters support a luxuriant bottom vegetation, chiefly water milfoil, hornwort, water buttercup (*Ranunculus tricophyllus*), and pondweeds (*Potamogeton Richardsonii*, *P. compressus*, *P. Friesii*); duckweed (*Lemna trisulca*) is extremely abundant. In some years Kamloops trout are plentiful and they feed upon the numerous insect larvae, molluscs (*Lymnaea* sp., *Pisidium* sp.), and amphipods.

Alkali Lake.—1 Mile by ½ mile; 51° 122° N.E. Alkali Lake lies in a narrow valley 20 miles south of Springhouse Prairie. The name was derived not from the water but from a conspicuous outcrop of alkali on a bare hillside above the lake—the water is not highly alkaline and is used for irrigation. Along Alkali Creek, which drains the lake into the Fraser River, and on the shores of the lake, are marshes of cattail (*Typha latifolia*), round-stem bulrush, and sedges. Submerged flora in order of abundance is muskgrass, *Chara* sp., water milfoil, and sago pondweed. The lake contains lake shiners and probably other fishes; it is not rich in either crustaceans or aquatic insect larvae.

Boitano Lake.—1¼ Miles by ⅜ mile; 51° 122° N.E. This is a 'soda' lake, with hard, boulder-strewn shores except on portions of the west side, where there is a narrow belt of round-stem bulrush. The water is fairly clear and in it are numerous phyllopods and other small animals. There appears to be no bottom vegetation.

Bridge Creek.—38 Miles long; 51° 120° N.E. Bridge Creek, about 20 ft. wide at its mouth, enters the east end of Horse Lake through a belt of marsh that is chiefly round-stem bulrush and tall horsetail, *Equisetum* sp., on the outer margin, with sedges, succeeded by low shrubbery, chiefly willows and dogwood, *Cornus stolonifera*, farther inshore. Above the mouth the stream's course is tortuous, winding through a flat valley more or less covered with the

same type of brush that lines the stream banks; a succession of pools and shallows is navigable by canoe for about one mile. The outlet, at the west end of Horse Lake, is about 50 yd. wide; downstream it narrows gradually to a general width of about 50 ft. for the $1\frac{1}{2}$ miles it is navigable by canoe. The shores are lined with sedges and horsetail, these marshes being much more extensive near the outlet, where they merge with hay meadow and willow swamp.

Buffalo Lake.—$3\frac{1}{4}$ Miles by $\frac{5}{8}$ mile; 51° 121° N.E. The lake is in two portions joined by a shallow channel, in which lie a number of rocky, brush-covered islands surrounded by cattails. The bottom and the shores are boggy. On Aug. 7, 1936, the westerly portion, some 300 acres, was covered with a dense vegetation including pondweeds (*Potamogeton pectinatus*, *P. pusillus*), water milfoil, hornwort, and the duckweeds, *Lemna minor* and *L. trisulca*, all this vegetation being more or less enmeshed by filamentous algae. The lake is an irrigation reservoir, subject to a seasonal rise and fall of water level; on the date mentioned it did not exceed 2 ft. in depth. The easterly portion of of the lake is deeper with marsh growth generally restricted to the shores.

Beaver Dam Lake.—1 Mile by 1 mile; 51° 121° S.W. This lake lies on an extensive plateau covered by open forest cut through by grassy lanes connecting wide prairies. The main body is nearly circular in shape and there are several long, narrow bays. Behind a fringe of deciduous growth, which in most places is low and sparse, is a gumbo ridge spotted with boulders. This is fairly uniform in its height of from 6 to 9 ft., with a basal width of 12 ft., and in places it runs in a seemingly straight line, as if laid out by human hands. From this curious formation, evidently the result of ice action, the lake takes its name. Another curious feature, observed on Apr. 28, 1939, but not known to be a constant phenomenon, is that the reflected images of grey and white cumulus clouds were tinged with transient yellows, lavender, blue, and green. The water is clear and the lake shallow over much of its extent and here round-stem bulrushes form extensive open marshes. The narrow bays are grown up with round-stem bulrush and sedges. There are two heavily wooded islands in the lake; one, of approximately 50 acres, is separated from the mainland by a wide, deep bulrush marsh, which continues around the south end of the island and into the main part of the lake. The other, some two acres in extent, is about a quarter-mile distant from the north shore.

Cumming's Lake.—$\frac{3}{4}$ Mile by $\frac{1}{4}$ mile; 52° 121° S.W. On the south side thick forest growth reaches the lake shore and here are many Douglas fir stubs standing both in the water and on land above high-water mark. These would seem to have been killed many years ago and now, barked and partly hollow, they serve as nesting places for various birds. Along the north side is open, hilly prairie and narrow channels have made islands of three small grassy hills on which grow some brush and aspen. There are several small, round-stem bulrush marshes, where the plants are tall and vigorous. The

waters contain a dense bottom flora, including musk grass, sago pondweed, water milfoil (*Myriophyllum exalbescens*) and hornwort; in late summer, enormous numbers of a cladoceran, *Daphnia magna*, darken the water.

Deka Lake.—9 Miles by ¾ mile; 51° 120° N.W. Altitude 3700 ft. A deep lake, tributary to Bridge Creek, with shallow bays and constricted midway narrows about 200 yd. wide, where the water is shallow over a marl bottom. Extending inland from the east shore of the narrows is a wide bog, bisected by a long, wooded peninsula, where a scattered growth of cattails is general. The amount of submerged growth in the shallows is slight. Water smartweed, *Polygonum amphibium*, is conspicuous and buckbean, *Menyanthes trifoliata*, is plentiful in places along shore. The lake contains a large number of Kamloops trout; other elements of the fish population are not known. Molluscs, including *Pisidium* sp., *Planorbis* sp., and *Lymnaea* sp., are plentiful. It is of little importance as a nesting ground for waterfowl.

"Disputed Lake."—50 Acres; 51° 120° N.E. Elevation approximately 3725 ft. This small lake, situated in a narrow upland valley, is the product of beaver work on a small stream, now dry, that formerly entered Horse Lake. The lake is in two parts joined by a deep channel through flooded bog, in which many old dead willows and aspens are still upright. The shores are boggy, with a littoral vegetation chiefly of willow, dogwood, alder, and a marginal growth of rank sedges and round-stem bulrushes. Remains of old broken-down beaver lodges, covered with similar vegetation, form small, solid islands. The water is peat-stained, the bottom soft. Small crustaceans, aquatic insect larvae, molluscs, and bryozoa are plentiful. The submerged vegetation includes pondweeds (*Potamogeton* species), water buttercup (*Ranunculus* sp.), duckweed (*Lemna trisulca*), and watermoss (*Fontinalis* sp.). Water smartweed and yellow pond lily are conspicuous.

Elliott Lake.—⅓ Mile by ⅛ mile; 51° 121° N.E. This is a small freshwater lake with soft shores and light marginal growth of round-stem bulrush that at the north end becomes abundant enough to form a small marsh. The surroundings are semiopen range.

Exeter Lake.—1 Mile by ⅜ mile; 51° 121° N.E. Situated in a wide, open valley between low, timbered hills. The bottom is soft marl and hydrophytic vegetation is limited chiefly to yellow pond lily and water milfoil, neither very abundant, cattail, round-stem bulrush and sedges, the latter established between a fringe of willows and the boggy lake margin. Cattails occur mostly at the east end where boggy ground prevails over a large area that includes the shores of the outlet of 100 Mile Creek and an adjacent, narrow bay. Along the north shore is a spruce swamp, its outer edge separated from the soft shore by a narrow strip of the characteristic bulrush and sedges. Ling are known to be present and molluscs of three genera have been collected.

Green Lake.—12 Miles by 1 mile; 51° 121° S.E. The mineralized waters of this lake are clear, the shores and bottom hard and strewn with boulders and

gravel. The immediate surroundings are lodgepole pine and aspen forest, with many open, grassy glades. No vegetation is apparent either along the shores or on the bottom, which can be seen at a considerable depth through the clear water. Amphipods are abundant.

"Grus Lake."—½ Mile by ¼ mile; 51° 121° N.E. This marshy slough lies in open woods near the east end of Lac La Hache. It is entirely surrounded by round-stem bulrush marsh in open growth and of no great height. The shore at high-water mark is clay, but the lake bottom is chiefly marl. A limited amount of sago pondweed, water milfoil, bladderwort, and muskgrass is established. There are no amphipods nor molluscs and few aquatic insects.

Horse Lake, an expansion of Bridge Creek.—9 Miles by ¼ to 1 mile; elevation 3600 ft.; 51° 120° N.E. A deep lake with marshes at outlet and inlet and one marshy bay with marl bottom. Contains a fish population of Kamloops trout, lake trout, sucker, squawfish, chub, lake shiner, and ling. Cover vegetation in the marshes includes cattail, round-stem bulrush, horsetail, bur-reed, and various rushes and sedges. Other vegetation important in the economy of waterfowl is muskgrass, water smartweed, pondweeds (*Potamogeton pectinatus*, *P. pusillus*, *P. foliosus*, *P. Richardsonii*, *P. natans*, *P. zosterifolius*), and bushy pondweed (*Najas flexilis*). Invertebrates include amphipods, molluscs, and aquatic insect larvae.

Jones Lake.—1 Mile by ¾ mile; 52° 121° S.W. This is a shallow, marshy slough surrounded by open parkland forest and grasslands and draining through Jones Creek into the San Jose River. The outlet is dammed to retain water for irrigation and above this the creek winds through a marshy meadow of 20 acres or so. Cover plants in the marsh include cattail, round-stem bulrush (*Scirpus acutus* and *S. validus*), three-square bulrush (*Scirpus americanus* and *S. paludosus*), river grass (*Fluminea festucacea*), bur-reed (*Sparganium simplex*), and various sedges, including *Carex atherodes* and *C. rostrata*. The bottom vegetation in the creek and in the lake is dominated by muskgrass, widgeon grass, hornwort, water milfoil, and water buttercup. Water smartweed covers part of the surface. The waters are rich in animal life, including lake shiners, amphipods, and odonata nymphs.

Longbow Lake.—1½ Miles by 1¼ miles; 51° 121° N.E. This lake is hidden in lodgepole pine and aspen woods and not visible from the nearest trail, which passes within a quarter mile. The shores are covered with thick growth of willow and a little sedge and there are two small cattail beds. The water is deep except close in shore, where yellow pond lilies form a continuous belt 20 yd. or so in width. Muskgrass is the dominant bottom vegetation in deep water. At the outlet of a small creek that drains into Horse Lake grow water milfoil, hornwort, bladderwort, arrowhead (*Sagittaria latifo'ia*), pondweeds (*Potamogeton pectinatus*, *P. pusillus*), and duckweed, *Lemna trisulca*. Amphipods and a snail, *Physa* sp., were collected there Aug. 17, 1936.

Lac La Hache.—10½ Miles by ¼ to 1½ miles; 51° 121° N.W. Description in text.

Lily Pad Lake.—1½ Miles by ¼ mile; 51° 121° N.E. Used as a reservoir for the Clark Ranch, a high level being retained by a dam at the outlet at the north end. The water is peat-stained and in most places deep to the shoreline growth of dwarf birch, willow, spruce, and lodgepole pine. The bottom is hard and the shores stony. Yellow pond lily dominates the main part of the lake. At the south end is an open marsh of round-stem bulrush and at the north is a larger marsh of the same type with several deep channels through it and terminating in a sedge meadow. Aquatic flora, other than yellow pond lily, reaches the maximum of abundance in these marsh areas and includes water milfoil, pondweeds, and water smartweed. The most plentiful animal food is an amphipod; leeches, snails (*Planorbis* sp., *Lymnaea* sp.) are less abundant. Lake shiner apparently is the only fish present.

Mirage Lake.—1¼ Miles by ¼ mile; 51° 121° N.E. This is one of the so-called 'soda lakes' of the district; the waters contain so much sodium carbonate in suspension as to be nearly opaque. On Aug. 1, 1938, the maximum depth was 30 in. and the water area approximately 100 acres. The bottom is fairly hard and strewn with boulders, as are parts of the muddy shore. In places accumulations of boulders extend outward in the form of peninsulas and there is one boulder island separated from the shore by a 60-ft. channel. Above high-water mark a grassy flat extends to the edge of open forest, which is a quarter mile distant in some places. No vegetation grows in the lake or on its margin. The milky waters contain enormous numbers of phyllopods and corixids.

Nason's Slough, 121 Mile.—Area, 30 to 40 acres; 51° 121° N.E. This marshy slough lies in a wide meadow surrounded by open forest of the characteristic type. It is subject to periodic rise and fall and in 1931 was entirely dry and part of it was ploughed. In 1942 the slough was three-quarters full. Emergent vegetation was exclusively round-stem bulrush; several ponds amongst this growth were grown up with bladderwort, water smartweed, pondweed (*Potamogeton epihydrus*), and other aquatics. Molluscs collected there were identified as *Helisoma trivolis*, *Lymnaea stagnalis*, and *Sphaerium* sp.

103 Mile Lake.—¾ Mile by ¼ mile; 51° 121° N.E. A bare-shored lake with semiopen range on three sides and a wooded hillside on the other. There are open marshes of round-stem bulrush at either end and isolated stands of this plant along the west shore. Water smartweed covers large areas of the surface near shore and there is a heavy submerged flora, in which water milfoil, sago pondweed, and the pondweeds *Potamogeton pusillus* and *P. panormitanus* var. *major* predominate. Amphipods are abundant.

105 Mile Lake.—1¼ Miles by ½ mile; 51° 121° N.E. This is a fairly deep lake, rich in a submerged flora in which widgeon grass and sago pondweed are dominants. In midsummer much of the shoreline is concealed by a margin

of round-stem bulrush and the west end terminates in a marsh of this growth mixed with cattails. In July and August the water is turbid with algal bloom and filamentous algae cover parts of the surface. The surroundings are partly open range, partly open slopes with aspen stands on the north and spruce and lodgepole pine on the south.

108 Mile Lake.—1¼ Miles by ½ mile; 51° 121° N.E. This is a deep-water lake with a shoreline of clay and boulders sloping steeply in places. The west shore rising to a low ridge is timbered with spruce and lodgepole pine; elsewhere the shores are open grasslands, aspen stands, and brushy thickets. There is very little bottom vegetation and neither molluscs nor amphipods have been detected. The slight growth of aquatic plants comprises pondweeds and water milfoil. The only part that is at all rich in plant life is in front of several deserted ranch buildings, where a comparatively thick growth of round-stem bulrush at high-water mark, succeeded by spike rush. *Juncus balticus*, farther out, terminates in a bed of water milfoil. Several of five small, stony islands lying close to shore are covered with a thick vegetation that includes small aspen, dwarf birch, willow, loco-weed, vetches, silverweed, aster, and various grasses. This lake contains a fish population of suckers and lake shiner.

130 Mile Lake.—1¼ Miles by ⅛ to ¼ mile; 51° 121° N.W. This is an expansion of the San Jose River between Lac La Hache and Williams Lake. Much of the surface is covered with the leaves of yellow pond lilies. The bed of the lake is mostly marl and the bottom is visible through the clear, shallow water. In several areas are thick, matted growths of water milfoil and bladderwort and there is also a scanty growth of pondweeds and some duckweed. Other portions of the lake bottom are entirely bare of vegetation. The shoreline growth is composed of round-stem bulrush, cattails, spike rush (*Eleocharis* sp.), slough grass (*Spartina gracilis*), and sedges including *Carex lanuginosa*, *C. lasiocarpa*, *C. Sartwellii*, and *C. aquatilis*, which at the south end of the lake form a considerable marsh.

149 Mile Lake.—¾ Mile by ⅜ mile; 52° 121° S.W. Two lakes separated by a stony ridge; the smaller is encircled by heavy round-stem bulrush growth and this occurs in isolated patches on the larger lake, which has a generally open and boulder-strewn shore. Both are rich in aquatic flora and the invertebrates associated with it. The surroundings are grasslands and aspen woods (Fig. 6).

150 Mile Lake.—Approximately 25 acres; 52° 121° S.W. Used as an irrigation reservoir by the 150 Mile Ranch. The shores along the south half are heavily wooded. There is a marsh of round-stem bulrush at the north end. Various pondweeds, including *Potamogeton pectinatus*, *P. Friesii*, and *P. compressus*, and other aquatics are represented; molluscs are particularly abundant.

"*Pete Kitchen Lake*".—80 Acres; 51° 121° N.E. A large, deep slough, surrounded by low, rolling hills, on which are scattered clumps of aspen. The shores of clay, interspersed by stretches of sand and boulders, are partly open, partly covered with bulrush marsh. Aquatic flora is abundant and includes hornwort, water milfoil, and pondweed (*Potamogeton pusillus*); charophytes also are abundant; molluscs and an unidentified crustacean are plentiful.

Rail Lake.—2 Miles by 1 mile; 51° 120° N.E. This lake is larger than is indicated on Provincial Government maps. The greater part of the shore, except for occasional narrow beaches of boulder or shingle, is forested with spruce on the wet portions and lodgepole pine and aspen on the dry portions. At the west end, separated from the lake by a growth of spruce and an old willow-covered beaver dam, is a boggy sedge meadow of about 80 acres. In the centre is a 10-acre pond with boggy shores encircled by yellow pond lily. The east portion of the lake is shallow, with submerged forests of tall pondweeds, *Potamogeton praelongus* and *P. natans*; there is a limited amount of muskgrass, sago pondweed, bushy pondweed, and some shoreward growth of arrowhead, water milfoil, and other aquatics. Snails are plentiful and there is a fish population of Kamloops trout, squawfish, chub, suckers, and lake shiners.

"*Rush Lake.*"—25 Acres; Springhouse Prairie. 51° 121° N.E. This shallow slough is surrounded on two sides by round-stem bulrush marsh; the remainder of the shore is hard clay and boulders. Near the centre is an island of bulrush several acres in extent. Bottom vegetation is chiefly widgeon grass; invertebrates, including amphipods, cladocerans, and insect larvae, are abundant.

Soda Lake.—108 Mile Ranch. 1 mile by $\frac{3}{8}$ mile; 51° 121° N.E. The mineralized waters are clear, the shores hard and without vegetative cover. The surroundings are part rolling grasslands, part open forest (Fig. 9).

"*Sorensen Lake.*"—$\frac{3}{4}$ Mile by $\frac{1}{8}$ mile; 51° 122° N.E. Formerly connected with Westwick Lake, now separated from it by a graded road. It extends for approximately three-quarters of a mile along a narrow valley bottom and is surrounded by sloping pasture on one side and cultivated fields on the other. The entire lake is surrounded by a vigorous growth of round-stem bulrush. The same bottom flora and invertebrates found in Westwick Lake occur here (see Westwick Lake).

Succour Lake.—$\frac{3}{4}$ Mile by $\frac{1}{4}$ mile; 51° 121° N.E. This is a fairly deep lake, with shores wooded to the water's edge except at the east end where there is a small round-stem bulrush marsh. The bottom is moderately hard and scattered with boulders in the shallows; the water is clear and bottom flora scanty, comprising small beds of charophytes, horsetail, pondweeds (*Potamogeton pectinatus, P. natans, P. pusillus*), yellow pond lily, and water milfoil. Suckers and chub are abundant.

Straight Lake.—1¾ Miles by ⅛ mile; 51° 121° N.E. Straight Lake occupies a narrow valley, its western extremity about three miles east of the Cariboo Highway. The old Canim Lake Road, long unused and with bridges and culverts washed out, passes along the north side. Much of the lake is covered by round-stem bulrush marsh (Fig. 8) with scattered clumps of cattail; some of the open places have a limited amount of vegetation, chiefly yellow pond lily, water milfoil, and sago pondweed; the easterly portion is covered in places by muskgrass meadows, elsewhere are areas of marl on which there is no vegetation. Snails (*Planorbis* sp. and *Lymnaea* sp.) are present.

Simon Lake.—1½ Miles by ¼ mile; 51° 121° N.E. A short distance north of Straight Lake. The south side is forested, the north side chiefly open prairie. A round-stem bulrush marsh extends out from the shore in some places, in others a strip of open water separates the shore and the marsh. The shores and bottom are chiefly hard clay, sand, and boulders. There is an abundance of aquatic vegetation, including yellow pond lily, water milfoil, and pondweeds. Amphipods and molluscs are plentiful.

San Jose River.—24 Miles long; 51° 121° N.W. Between Lac La Hache and Williams Lake. For a mile or so above 130 Mile Lake, an expansion of this river, it winds through a round-stem bulrush and cattail marsh. Near its entrance to that lake the bottom is boggy; farther upstream the shores are lined with sedges and shrubbery and the bottom is hard supporting a growth of hornwort, pondweeds (including *Potamogeton Richardsonii*), and water buttercup, *Ranunculus aquatilis*.

Springhouse Prairie.—51° 121° N.E. Several thousand acres of level or slightly rolling grassland and meadow in which are numerous ponds and sloughs.

Sheridan Lake.—51° 120° N.W. Altitude 3600 ft. Covers an area of approximately eight square miles. The surrounding forest is lodgepole pine, Douglas fir and aspen, with Engelmann spruce in the moist declivities. The lake is of irregular shape, with numerous arms terminating in marshy bays of round-stem bulrush. Aquatic flora here is chiefly yellow pond lily and pondweeds (*Potamogeton Richardsonii*, *P. heterophyllus*), mare's tail, bladderwort, water milfoil, and arrowhead. On the boggy shores are various sedges, including *Carex diandra*, and amongst these, in late summer, the seed heads of cotton grass, *Eriophorum Chamissonis*, are conspicuous. Away from the marshes along the open lake-shore the aquatic vegetation is limited to occasional patches of *Potamogeton natans*. The water is clear and apparently contains a large amount of sodium carbonate. Insect and small animal life is not abundant and apparently does not include either amphipods or crustaceans. Suckers and lake shiners are reported to be the only fishes present.

Tatton Lake.—1½ Miles by ⅜ mile; 51° 121° N.E. This is actually three lakes, separated by bulrush marshes that extend around most of the lake margin also. The surroundings are partly open range, partly lodgepole pine and

aspen forest. The bottom of the lake is covered in places with muskgrass meadows; elsewhere water milfoil and bladderwort are dominant. The waters are rich in small invertebrates.

Westwick Lake.—1¼ miles by ⅜ mile; 51° 122° N.E. Near its northern end for a distance of 100 yd. or so the lake is restricted to a width of 30 yd., forming a channel that in midsummer may dry out and isolate the upper one-fifth of the lake. The shores are boggy, supporting on the west side a fairly continuous but narrow belt of round-stem bulrush and some patches of three-square bulrush, *Scirpus robustus*. At the south end this growth broadens into a marsh of about 20 acres. The waters are rich in plant life, widgeon grass and sago pondweed being the dominant species. Amphipods, molluscs, and aquatic insect larvae are abundant.

Watson Lake.—1½ Miles by ¼ to ½ mile; 51° 121° N.E. A shallow, muddy lake surrounded by rolling, grassy hills dotted with aspen bluffs and by open woods in which aspens predominate. There are areas of round-stem bulrush along shore and at the north end a marsh of this growth is succeeded inshore by rivergrass, rushes, chiefly *Juncus balticus*, and sedges. Submerged flora is restricted to certain portions of the lake and there are large areas of muddy lake bottom completely bare of vegetation.

Williams Lake.—5 Miles by ½ to ¾ mile; 52° 122° S.E. Altitude 1843 ft. This is a deep lake, connected with Lac La Hache by the San Jose River and drained into the Fraser River by Williams Creek. At the east end are an important round-stem bulrush marsh, extensive tracts of cattail, and sedge meadows in which *Carex rostrata* is prominent. Submerged vegetation includes water milfoil, widgeon grass, pondweeds (*Potamogeton Friesii*, *P. heterophyllus*, *P. pectinatus*, *P. Richardsonii*), bushy pondweed, mare's tail, and hornwort. There is an abundance of the duckweeds, *Lemna minor*, *L. trisulca*, and *Spirodela polyrhiza*. Along this portion of the lake, also on grassy hills that slope from the north side, are numerous junipers, *Juniperus scopulorum*, of tree size—a conspicuous feature of the landscape.

At the west end, near the outlet, a narrow peninsula, wooded along its shores with cottonwood, aspen, willow, alder, and dogwood, extends into the lake. On a line with its outer extremity and separated from it by shallow, marshy channels are two islands of the same character as the peninsula. A marginal belt of trees screens grassy knolls and areas of shrubbery. Williams Creek winds through a round-stem bulrush and cattail marsh of 50 acres or so. The bottom, both in the shallow bays and in the marsh at the outlet, is partly marl, partly sand and gravel. The marl portions carry little submerged vegetation; on the hard bottom horsetail and water milfoil are dominant. Duckweed, *Lemna minor*, is plentiful in the marsh.

The invertebrate fauna in both sections of the lake is essentially that of Lac La Hache.

Appendix B

Birds and Insects

The problem of birds in their relation to insect outbreaks in British Columbia has received little more than passing comment from the ecologist. Grasshoppers, perhaps, are the insects most destructive to forage plants in the Cariboo Parklands. It is known that many species of birds feed upon them but little has been learned concerning the complex relationship here involved between bird, insect, and plant. The relation of this question to the cattle industry is obvious.

It would seem that when grasshoppers are most plentiful, that is in peak years, this abundant food supply is an important factor in establishing a higher than normal rate of survival in such birds as crow, red-winged blackbird, yellow-headed blackbird, Brewer blackbird, western meadowlark, sparrow hawk, and mountain bluebird. Such a tendency has been observed but until evidence in the form of population counts over a period of years is available the facts cannot be demonstrated.

Outbreaks of forest tent caterpillar that defoliate entire stands of aspen and cottonwood (Fig. 10) in the Cariboo Parklands occur periodically and usually two years in succession. The last outbreak took place in 1941 and 1942.

To what extent birds feed on the larvae of this insect is not known, the only species actually seen doing so being the solitary vireo. One adult forest tent caterpillar was an item in the stomach contents of a black tern.

Adult corixids and the nymphs of damselflies, *Enallagma* sp., are eaten by numerous species of birds that frequent lakes and marshes—not only water birds but some land birds as well. Such investigations as have been made indicate that these insects may represent the most important item of animal food in the diet of young grebe and ducks of various species. Damselfly nymphs are eaten by waders and by other kinds of shore-loving birds; they are a staple food in the diet of both adult and young of red-winged blackbird and yellow-headed blackbird during the nesting season.

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